Precision Cooling for
Business-Critical Continuity

Liebert HPM

4-99 kW Indoor Room Cooling Units

A/W/F/D/H Versions

SERVICE MANUAL

English	Cod. 273190	Rev. 20.11.2009

Liebert.

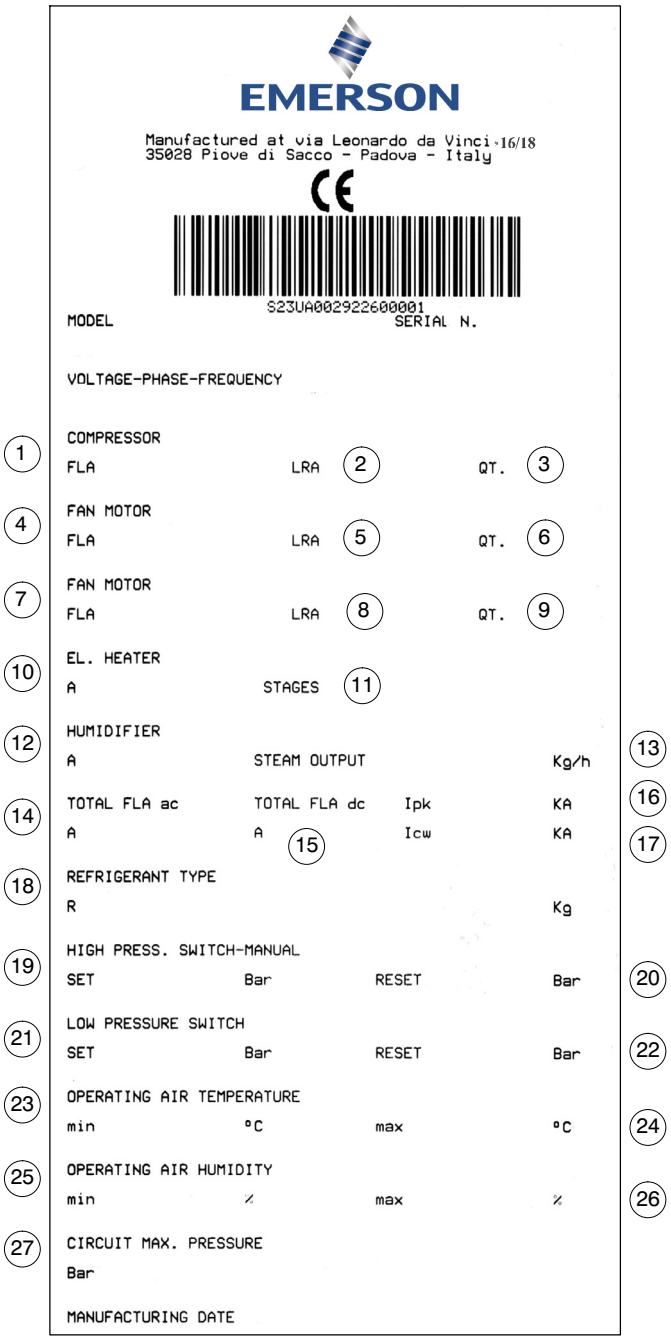
EMERSON
Network Power

Caution

We recommend that:

- the manual is retained for the entire service life of the machine;
- the user reads the manually carefully before carrying out any operations on the machine;
- the control is used exclusively for the purpose for which it is intended; incorrect use of the control shall release the manufacturer from any liability.

This manual has been prepared to enable the end–user to carry out only the operations that can be made with the panels closed. Any operations that require the opening of doors or equipment panels must be carried out only by qualified personnel.
Each machine is equipped with an Electric Insulating device which allows the operator to work in conditions of safety. **Switch off the machine with this electric insulating device before any maintenance operation to eliminate risks remaining** (electric shocks, burns, automatic restarting, moving parts and remote control).
For "UNDER" units installed on raised floor: switch off the machine before removal of the floor panels within a distance of 850 mm from the machine, to avoid risks of contact with rotating devices (fans) moving and with hot heating elements.
The panel key supplied with the unit must be kept by the person responsible for maintenance.
For identification of the unit (model and serial no.) in case of the necessity for assistance or spare parts, locate the identification label on the outside of the unit.

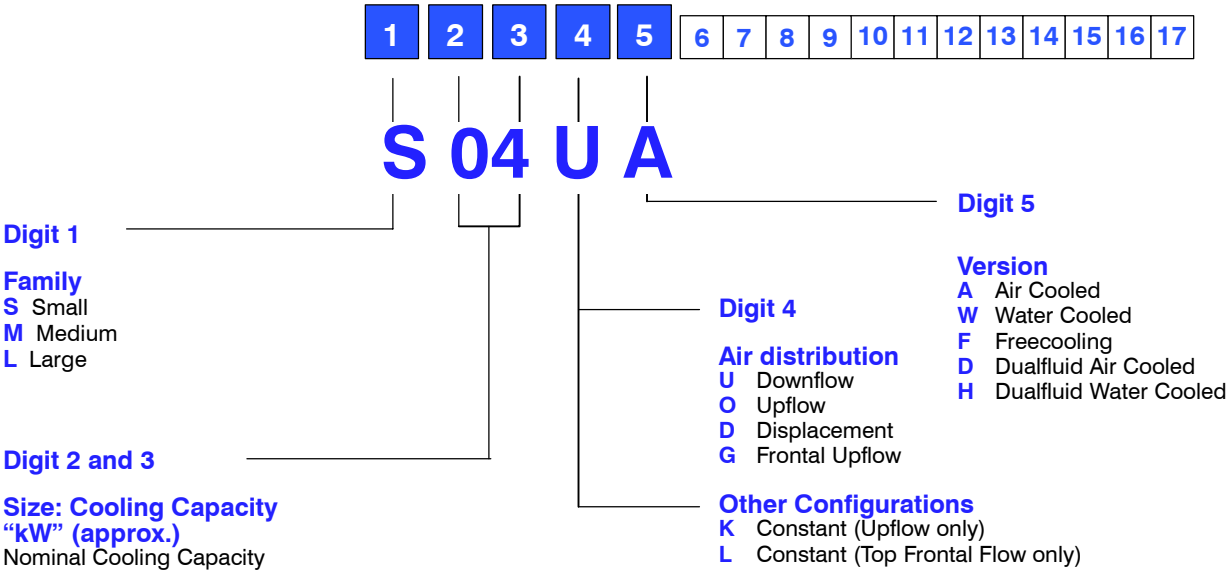


Attention: data relevant to the supplied unit are indicated on the inboard label (see below empty fax–simile).
Data in the manual are referred to standard conditions and can be modified without any advance notice.

POS.	DESCRIPTION
1	Compressor Full Load Ampere [A]
2	Compressor Locked Rotor Ampere [A]
3	Compressor quantity
4	Evaporator fan Full Load Ampere [A]
5	Evaporator fan Locked Rotor Ampere [A]
6	Evaporator fan quantity
7	Condenser fan Full Load Ampere [A]
8	Condenser fan Locked Rotor Ampere [A]
9	Condenser fan quantity
10	Electrical heating Ampere
11	Electrical heating steps
12	Humidifier Ampere
13	Steam production capacity
14	Max. unit AC Ampere
15	Max. unit DC Ampere
16	Rated peak withstand current
17	Rated short–time current
18	Refrigerant type
19	High pressure switch Stop
20	High pressure switch Restart
21	Low pressure switch Stop
22	Low pressure switch Restart
23	Min. room operation temperature
24	Max. room operation temperature
25	Min. room operation humidity
26	Max. room operation humidity
27	Max. refrigeration circuit pressure

Digit Nomenclature (DX unit)

The unit is fully defined by seventeen digits.



Digit 6 – Fan

0 Standard fan
1 EC fan

Digit 7 – Main Power Supply

0 400 V/3 Ph/50 Hz
1 230 V/3 Ph/50 Hz
2 230 V/1 Ph/50 Hz

Digit 8 – Electric heating

0 None
1 Electric heating

Digit 9 – Humidification

0 None
V Electrode humidifier

Digit 10 –Microprocessor Control

2 ICOM & Inner Display with Temperature Control
3 ICOM & Inner Display with Temperature and Humidity Control
A ICOM & Coldfire Display Small with Temperature Control
B ICOM & Coldfire Display Small with Temperature and Humidity Control
C ICOM & Coldfire Display Large with Temperature Control
D ICOM & Coldfire Display Large with Temperature and Humidity Control

Digit 11 –Reheating System

0 None
G Hot gas coil
W Hot water coil

Digit 12 –Air Filter Efficiency

0 G4
1 F5
2 G4; with Clogged Filter Pressure Switch
3 F5; with Clogged Filter Pressure Switch

Digit 13 –Refrigerant

0 R407C
1 R22

Digit 14 –Paint

0 RAL 7035 Colour
1 CHARCOAL GREY Colour
2 BLACK Emerson 7021 Colour

Digit 15 –On board MCB, for Remote Air Condenser

0 No MCB
1 MCB 6 A single circuit condenser
2 MCB 10 A single circuit condenser

Digit 16 –Packing

For S04, S05, S07, S10 and S12xx units
F PLP and Pallet
G PLP and Wooden Crate
M Seaworthy

For all other units
P PLP and Pallet
C PLP and Wooden Crate
S Seaworthy

Digit 17 –Special Requirements

0 Standard Emerson Network Power
X Special Emerson Network Power

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1 – Preliminary operations

1.1 – Inspection

On receiving the equipment immediately check its condition; report any damage to the transport company at once.

1.2 – Handling

- Always keep the unit vertically upright and do not leave it out in the open.
- Transport the unit using a fork lift truck with front–-shoulders at least 1.5 m high, to avoid upsetting danger.

Fig. a – Unit handling

1.3 – Operating limits

The units are designed to operate within working ranges (see Tab. a).
These limits are referred to new machines or to those that have been correctly installed and serviced.
The warranty clauses are no longer valid for any possible damage or malfunction that may occur during or due to operation outside the application values.

Tab. a – Operating limits

For all units

Room air conditions	from:	18°C, 45% R.H.
		for L83Ux, L99Ux: 21°C, 40% R.H.
Room air conditions	to:	27°C, 55% R.H
Hot water circuit	inlet water temperature	max. 85°C
	water pressure	max. 8.5 bar
Storage conditions	from:	– 20°C
	to:	50°C
Power supply tolerances		V ± 10% Hz ± 2

For A and D units

Outdoor temperature: lower limit Exceeding of winter lower limits will temporarily cause a compressor stop.		
down to +10°C	from +9°C to –20°C	below –21°C
standard unit	VARIEX required	Consult HPAC Technical Sales Support
Outdoor temperature: higher limit This limit is determined by coupled condenser model. Exceeding of this limit (or a lack of maintenance), will caused a compressor stop by HP safety thermostat. Reset to normal operation can only be carried out manually.		

Relative position room unit vs. remote condenser		
From unit to condenser max distance	up to 30 m equivalent length	from 30 to 50 m equivalent length
From unit to condenser max geodetic height (1) (2)	from 20 m to –3 m	from 30 m to –8 m
Requirements		
Pipe diameter	see Tab. c	see Tab. c
Oil traps on vertical line of gas refrigerant	every 6 m, max	every 6 m, max
Extra oil charge	see Tab. 7	see Tab. 7
Variex installation	suggested	mandatory
Condenser	design	oversized +15%
Hot gas reheat	allowed	NOT allowed
Additional non return valve on delivery line, at 2 m from compressor	not necessary	mandatory

For W, F and H units

Water or mixture temperature to condenser, lower limit (other information par. 5.4)	min. 5°C

For F, D and H units

Chilled water circuit	
inlet water temperature	min. 5°C
water pressure	max. 16 bar
Max. differential pressures on the modulating valve (2 or 3 ways) – Max. differential pressure through the closed valve: Δp_{cv} – Max. differential pressure across the valve for modulating service: Δp_{ms}	

Models	**Δp_{cv} (kPa)**	**Δp_{ms} (kPa)**
S17xF/D/H	300	300
S20xF/D/H	300	300
S23xF/D/H	300	300
M25xF/D/H	300	300
M31xF/D/H	175	175
M34xF/D/H	175	175
M35xF/D/H	175	175
M41xF/D/H	175	175
M42xF/D/H	175	175
M47xF/D/H	175	175
M50xF/D/H	175	175
M58xF/D/H	175	175
L83xF/D/H	150	200

(1) Positive difference in height: condenser above conditioner
(2) Negative difference in height: condenser below conditioner

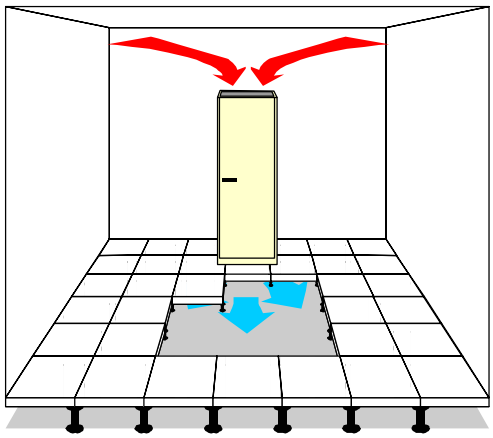
Other information in para 5.3.

1.4 – Noise level limits

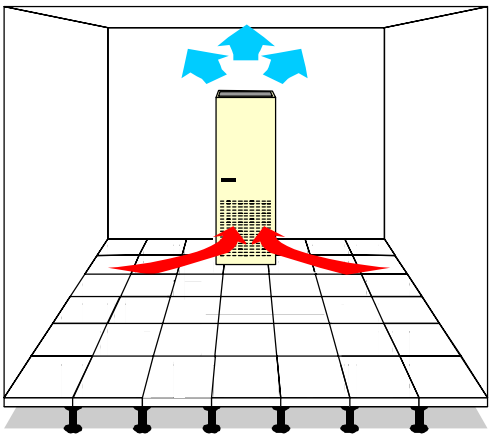
The sound pressure level in free field at 1.5 m height and 2 m in front of the air conditioner, with compressor and fan in operations, is less than 70 dBA for all models.

The units are available in the four configurations shown below.

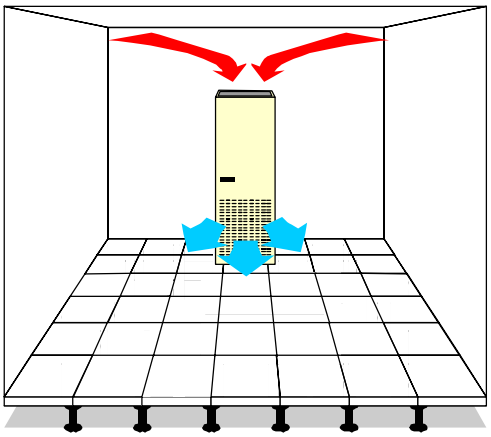
U / UNDER
Downflow



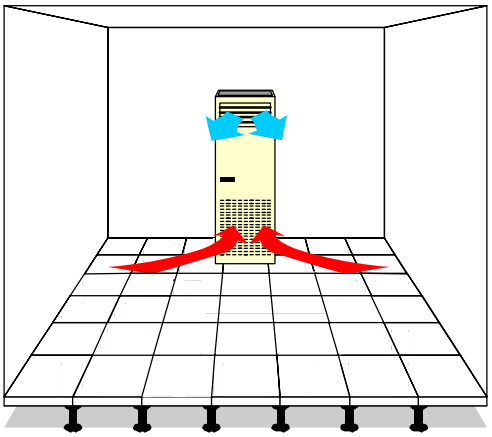
O, K / OVER
Upflow with front air return



D / DISPLACEMENT
Frontal air discharge at floor level



G, L / GRILLE
Frontal upflow with front air return



S04–05 models

2 – Positioning

See overall dimensions and service area drawings in **Enclosures C**.

Note for ducted Over conditioner and with electrical heaters in the case of plenum or duct not supplied by us.

To avoid overheating of insulation material of a plenum or a duct, in the case of a ventilation fault, before the safety thermostat intervention, it is mandatory to locate the insulation material at a distance higher than 30 cm from the top of the of the air conditioner.

3 – Installation

ATTENTION: The conditioner must never be installed out of doors.

See drawings in **Enclosures C**.

3.1 – Base module

If there is no raised floor below the unit it must be placed on a base module to allow access to the external connections. The conditioner is connected to the base module by 4 screws.

4 – Refrigeration connections

4.1 – Refrigeration pipeline connections (A and D)

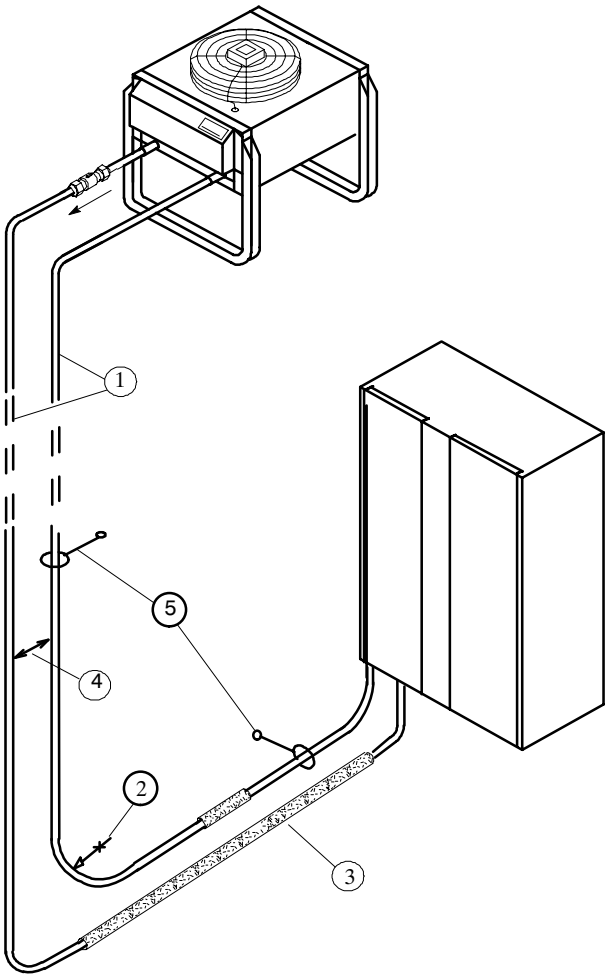
The air condensing units are delivered helium–pressurized at 1 bar.

The discharge operation of the room unit pressurized with helium (at 1 bar) and the de–welding of the bottoms from the connections must be carried out as last operations, immediately followed by the connection and emptying of the whole system.

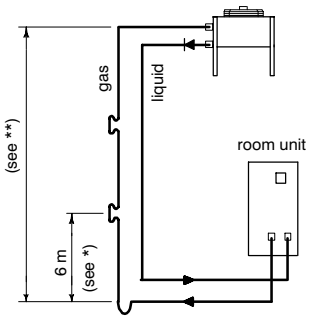
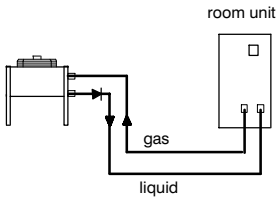
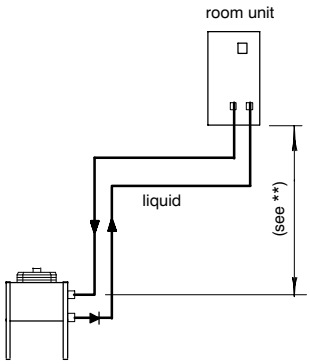
4.1.1 – General layout (Tab. b)

1) In soft or hard copper.
   The diameter required is stated in Tab. c.
   If the installer intends to use pipes of a larger diameter (e.g. for long winding runs) then consult HPAC Technical Sales Support.
   Use as short refrigeration pipelines as possible to minimize the total charge of refrigerant and the pressure drops. For long runs (over 50 equivalent m) contact HPAC Technical Sales Support.
   Lay the horizontal gas pipes with 1% downward gradient towards the refrigerant flow.
2) Reduce the number of bends, which must be of large radius, to a minimum.
3) Insulate the piping as specified in Tab. b. If the pipes are put next to electrical cables it is advised to insulate them to avoid damage to cable insulation.
4) There must be a minimum separation of 20 mm between the gas and liquid pipelines.
   If this is not possible insulate both lines.
5) Support both horizontal and vertical pipes with vibration–damping clamps (which include rubber gaskets). Place these every 1.5 – 2 m.

Fig. b – Recommended pipe layout



Tab. b — Condenser positioning

CONDENSER POSITION			CONDENSER ABOVE CONDITIONER	CONDENSER AND CONDITIONER AT SAME LEVEL	CONDENSER BELOW CONDITIONER (not recommended)
INSULATION	gas	int.	necessary	necessary	necessary
		ext.	only for aesthetic reasons	only for aesthetic reasons	only for aesthetic reasons
	liq.	int.	absolutely not	not necessary	no (expose to cold underfloor air)
		ext.	only for aesthetic reasons	only if exposed to sun	only if exposed to sun
LAYOUT			 (*) Oil traps every 6 m of vertical piping		

(**) see Chap. 1, Tab. a.

4.1.2 — Pipe diameter

The diameters of the connecting pipes between the conditioner and the condensing unit listed in Tab. c must be respected, otherwise the guarantee becomes invalid.

Tab. c — Pipe diameters (room unit — remote condenser)

STANDARD PIPE DIAMETERS (Valid for equivalent lengths up to 50 m)				
MOD.	copper tube external diametre x thickness [mm] R407C		copper tube external diametre x thickness [mm] R22	
	Gas	Liquid	Gas	Liquid
S04—05	10 X 1	10 X 1	10 X 1	10 X 1
S07	12 X 1	12 X 1	12 X 1	10 X 1
S10	12 X 1	12 X 1	12 X 1	12 X 1
S12	14 X 1	14 X 1	14 X 1	14 X 1
S13	14 X 1	14 X 1	16 X 1	16 X 1
S17	16 X 1	16 X 1	16 X 1	16 X 1
S20	18 X 1	16 X 1	22 X 1	18 X 1
S23	22 X 1	18 X 1	22 X 1	18 X 1
M25—29—31	22 X 1	18 X 1	22 X 1	18 X 1
M34	16 X 1	16 X 1	16 X 1	16 X 1
M35	22 X 1	18 X 1	28 X 1	22 X 1
M41—47	28 X 1	22 X 1	28 X 1	22 X 1
M42	18 X 1	16 X 1	22 X 1	18 X 1
M50—58	22 X 1	18 X 1	22 X 1	18 X 1
M66	22 X 1	18 X 1	28 X 1	22 X 1
L83	28 X 1	22 X 1	28 X 1	22 X 1
L99	28 X 1	22 X 1	28 X 1	22 X 1

When the pipes are more than 50 m long, contact Technical Support Department

4.1.3 — Installing pipelines

THE FOLLOWING OPERATIONS MUST BE CARRIED OUT BY AN EXPERIENCED REFRIGERATION TECHNICIAN.

The discharge operation of the room unit pressurized with helium (at 1 bar) and the de—welding of the bottoms from the connections must be carried out as last operations, immediately followed by the connection and emptying of the whole system.

1) Lay the piping, taking note of the following:
   - Welding:
     - All joints must be braze—welded.
     - Avoid butt welds by using sleeves or enlarging one of the pipes using a pipe opener.
     - Use silver—based solders and the correct apparatus.
     - Guarantee a correct weld as a refrigerant leak, or a faulty weld which leads to a leak later on, can seriously damage the air conditioner.
   - Always use large—radius curves (bending radius at least equal to pipe diameter). Bend the pipes as follows:
     - soft copper: by hand or bending device.
     - hard copper: use preformed curves. Do not overheat the pipes when welding so as to minimize oxidation.
2) Connect the pipes to the condenser:
   - Condensers with butt—welded pipe connections: cut the pipe, enlarge it and weld it to the pipeline.
   - Condensers with threaded tap connections: flange the pipes and connect.

   RESPECT THE DIRECTION OF REFRIGERANT FLOW (SEE LABELS ON REFRIGERANT CONNECTIONS).
3) Wash out the pipelines as follows:
   a) Plug up the free ends of the pipes.
   b) Connect a helium or nitrogen cylinder, fitted with a reducer (max. pressure 10 bar), to the ¼" SAE Schrader valve of the condenser.
   c) Pressurize the pipes with helium or nitrogen.
   d) Unplug the pipes instantaneously.
   e) Repeat a) — d) several times.

THIS OPERATION IS ESPECIALLY IMPORTANT WHEN HARD COPPER PIPING IS USED.

4) Open all the room unit shut−off valve.

5) Discharge the room unit pressurized with helium (at 1 bar) opening the charge valves so that all the branches of the circuit are discharged (e.g. on the receiver, on the low pressure side and on the compressor delivery).

6) De−weld the bottoms from the connections of the room unit.

7) Fix (weld) the pipes to the connections on the air conditioner.

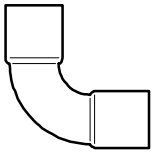
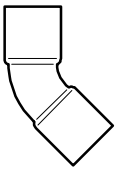
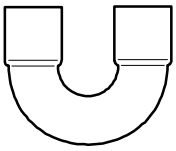
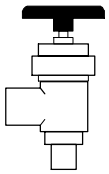
8) **Connect the refrigerant safety valve to the outdoor with a ∅ 16 copper pipe.**

Tab. d − Weight of refrigerant contained in piping during operation

EXTERNAL PIPE DIAMETER (mm)	gas (*)	liquid (+), at different condensing temperatures R407C (kg/m)			liquid (+), at different condensing temperatures R22 (kg/m)		
		35.0 °C	46.0 °C	57.0 °C	35.0 °C	46.0 °C	57.0 °C
10 x 1	0.0031	0.06	0.06	0.05	0.06	0.06	0.05
12 x 1	0.0049	0.09	0.09	0.08	0.09	0.09	0.08
14 x 1	0.0068	0.11	0.11	0.10	0.12	0.12	0.11
16 x 1	0.0085	0.17	0.16	0.15	0.18	0.17	0.16
18 x 1	0.012	0.23	0.22	0.20	0.24	0.23	0.21
22 x 1	0.019	0.34	0.32	0.31	0.36	0.34	0.33
28 x 1	0.033	0.58	0.55	0.52	0.61	0.58	0.55

(*) Due to the small weight influence (at 15.5 bar − discharge temp. 65°C), only 0.062 kg/l for R407C and R22 is considered.
(+) Liquid pressure and density varies according to condensing temperature (see refrigerant tables).

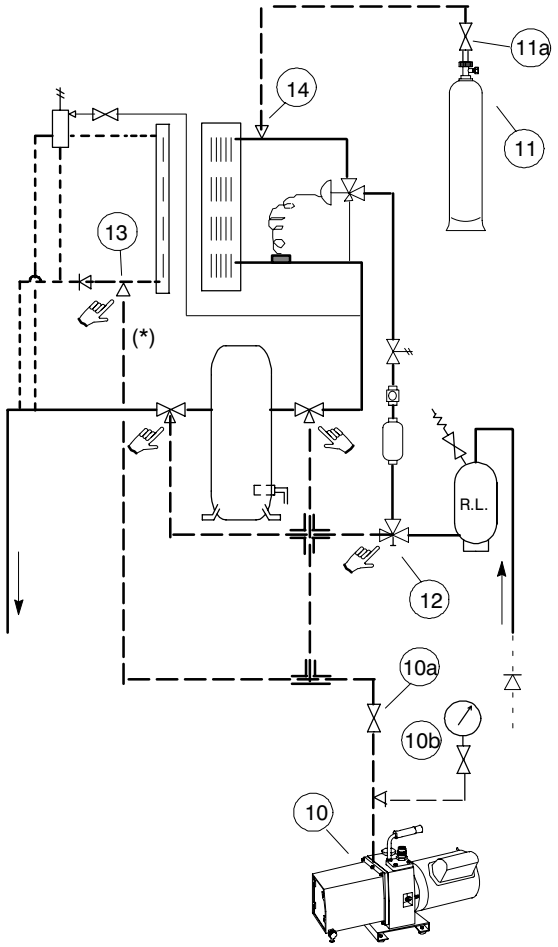
Tab. e − Equivalent lengths (m) of: curves, shut−off and non−return valves

Nominal diameter (mm)	 90°	 45°	 180°	 90°	
12	0.50	0.25	0.75	2.10	1.90
14	0.53	0.26	0.80	2.20	2.00
16	0.55	0.27	0.85	2.40	2.10
18	0.60	0.30	0.95	2.70	2.40
22	0.70	0.35	1.10	3.20	2.80
28	0.80	0.45	1.30	4.00	3.30

4.2 — Vacuum creation and refrigerant charge

Check the refrigerant type to be used on the data plate of the air conditioner and on the refrigerating compressor.

Fig. c — Pump and refrigerant charging cylinder connection for vacuum creation and refrigerant charge



(*) only with reheating coil (optional)

4.2.1 — R407C precharge (A and D)

1) ***Open all cocks of the system including those used for pressurizing*** (ambient unit and condensing unit). By this operation all the components of the refrigerating circuit must be subject to vacuum.
2) Connect a proper, high efficiency vacuum pump (10) ***suitable for polyester oils*** to the couplings:
   - ***Compressor intake and delivery*** using, if available, the three–way Rotalock cocks, coupling 1/4" SAE (make sure that all three ways are open), otherwise the Schrader valves welded on the pipings.
   - ***Three–way Rotalock cock***, ***coupling 1/4" SAE of the liquid receiver (12)*** (make sure that all three ways are open).
   - ***Schrader coupling (13)*** fit on the compressor or fan space, if the reheating coil option is available.
3) **Provide for a connection with refrigerant cylinder before making vacuum**.
4) Make the system vacuum up to 0.3 absolute mbar and after 3 hours check if 1.3 absolute mbar have not been exceeded. This condition warrants a humidity lower than 50 ppm inside the system.
   If the complete vacuum is not possible, this means that there are some leaks (to be removed according to the instructions in 6 below).

NEVER USE THE COMPRESSOR TO CREATE A VACUUM (THIS INVALIDATES ITS GUARANTEE).

5) Break the vacuum as follows:
   a) Close the cock (10a) for the vacuum pump (10).
   b) Open the cock of the refrigerant cylinder (11a) until the system reaches a pressure value of about 1 bar.

   The refrigerant must be introduced and charged by taking only liquid fluid from the cylinder.

   c) At this point both the vacuum pump and the refrigerant cylinder can be disconnected as follows:
      c1) close the cylinder cock (11a)
      c2) close the way 1/4" SAE of the Rotalock cocks and of the connected Schrader valves.
6) Inspect all connections/joints using a leak detector. If a leak is found, empty the pipes and the condenser, seal the leak and repeat the instructions in 3) — 6).
7) Now the machine is ready for completing the charge and the start–up.
8) Charge the refrigerant (**ONLY LIQUID**) by means of the charge valve placed at the evaporator inlet.

4.2.2 — R22 precharge (A and D)

1) ***Open all cocks of the system including those used for pressurizing*** (ambient unit and condensing unit). By this operation all the components of the refrigerating circuit must be subject to vacuum.
2) Connect a proper, high efficiency vacuum pump (10) to the couplings for:
   - ***compressor intake and delivery*** by using, if available, the three–way Rotalock cocks, coupling 1/4" SAE (make sure that all the three ways are open), otherwise the Schrader valves welded on the pipings.
   - ***Three–way Rotalock cock***, ***coupling 1/4" SAE of the liquid receiver (12)*** (make sure that all three ways are open).
   - ***Schrader coupling (13)*** fit on the compressor or fan space, if the reheating coil option is available.
3) **Provide for a connection with refrigerant cylinder before making vacuum**.
4) Make the system vacuum up to a residual pressure of 0.7 absolute mbar, then go on for 30 minutes.
   The pressure must be measured by means of a vacuum pressure gauge (10 b) on the system side.
   If the complete vacuum is not possible, this means that there are some leaks (to be removed according to the instructions given in 6 below).

NEVER USE THE COMPRESSOR TO CREATE A VACUUM (THIS INVALIDATES ITS GUARANTEE).

5) Break the vacuum as follows:
   a) Close the cock (10a) of the vacuum pump (10).
   b) Open the cock of the refrigerant cylinder (11a) until the system reaches a pressure value of about 1 bar.
   c) At this point both the vacuum pump and the refrigerant cylinder can be disconnected as follows:
      c1) close the cylinder cock (11a)
      c2) close the way 1/4" SAE of the Rotalock cocks and of the connected Schrader valves.
6) Inspect all connections/joints using a leak detector. If a leak is found empty the pipes and the condenser, seal the leak and repeat the instructions in 3) — 6).

4.2.3 — Refrigerant charge *(A and D)*

1) Start the unit as described in para. 7.1.

2) Manually start the compressor (ensure the unit is not in the dehumidification phase).

3) Guarantee a constant condensation temperature (preferably 42-45°C); if necessary, partially obstruct the condenser coil surface or limit its ventilating power to obtain these conditions.

4) Charge the unit until the working conditions of the entire refrigeration circuit have become normal.

5) Using a manometer, check that the evaporating temperature is above 0°C.

5) Verify that the superheat is 5-8 K (to do this refer to para. 9.1).

4.3 - Refrigeration circuits

See drawings in **Enclosure E**.

5 - Water connections

5.1 - General warnings

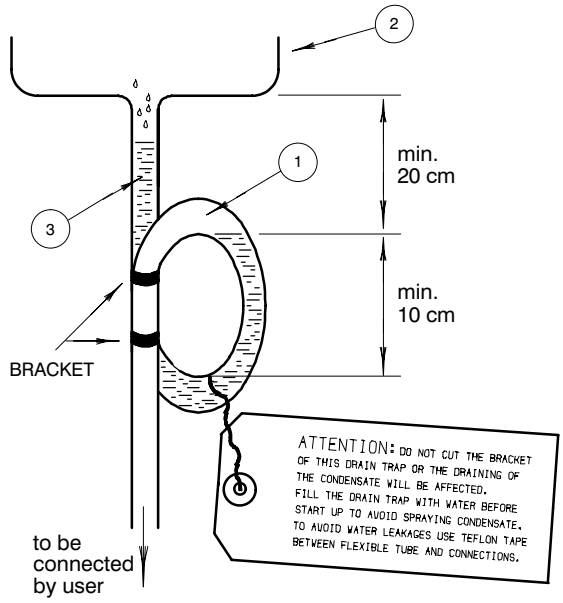
ENSURE THAT THE TUBING DOES NOT OBSTRUCT THE AIR FLOW*(Under only)*.

IF THE TUBING IS TO RUN OUTDOORS, ADD ETHYLENE GLYCOL TO THE CIRCUIT AS DESCRIBED IN PARA. 5.5.

5.2 - Water connections

- **Condensate drain** (Fig. d)**:**
  - Use galvanized steel, PVC or flexible polythene tubing.
  - Allow a 2% gradient towards the drain.
  - There must be a drain trap (1) placed at least 25 cm below the drain tray (2). In the units S13 ÷ S23, Mxx and Lxx the drain trap must be placed under the unit, in the false floor.
  - Fill the drain trap with water (3).

Fig. d - Condensate drain



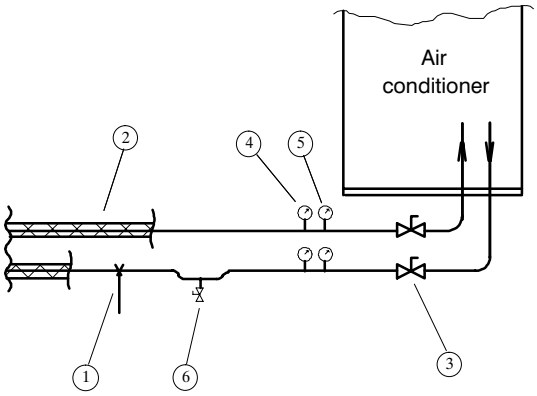
- **Humidifier** *(optional)*: See **Enclosure A**.

- **Hot water** *(optional)*:
  - Use copper or steel (Mannesmann) tubing.
  - Insulate both tubes using Armaflex insulation.

5.3 - Chilled water connections
(D and H only) - (Fig. e)

- Use copper or steel (Mannesmann) tubing.
- Place the tubing on supporting saddles (1).
- Insulate both tubes using Armaflex insulation (2).
- Place shut-off ball valves (3) at the conditioner inlet and outlet to allow easy maintenance.
- It is useful to install a thermometer (4) and a manometer (5) at the conditioner inlet and outlet.
- Install a water drain tap (6) at the lowest point in the circuit.
- Fill the circuit with water/glycol (see Fig. e).

Fig. e - Chilled water circuit



5.4 - Coooling water connections *(W, F and H only)*

The unit must receive cooling water as follows:

a) from an external cooling water source, in open circuit (para. 5.4.1 and Figures in Enclosures).

b) using a Dry cooler, in closed circuit (para. 5.4.2).

- Connect the piping as shown in **Enclosures D**.
- It is advisable to use hoses to be connected, with 3-piece joints, to the condenser water inlet and outlet couplings.
- IMPORTANT: fit a standard strainer on the inlet water piping.
- Place shut-off ball valves at the conditioner inlet and outlet to allow easy maintenance.
- It is advisable to install a water drain system at the lowest point in the circuit.
- Fully drain the piping before connecting it to the air conditioner.

5.4.1 - Notes for open circuit applications

- Use the unit with mains or well water.
  DO NOT USE WATER FROM AN EVAPORATIVE COOLING TOWER UNLESS THE FILLING WATER HARDNESS IS CONTROLLED.
- The water pressure must be 2 - 10 bar (if this is not so, contact the Technical Support Department).
- The required water flow at different temperatures is given in our catalogues or on request.
- If necessary (very low water temperature) insulate both pipes using Armaflex insulation.

5.4.2 — Notes for closed circuit applications

- The installation in Fig. f is indicative only; for individual installations follow the project diagram.
- ***Install a pump system*** calculated on the basis of the flow and total head of the system (see project data), ***and controlled by the compressor running*** (see label on the unit).
- Insulate both pipes using Armaflex insulation.
- VERY IMPORTANT: Add water and ethylene glycol to the circuit, when the ambient temperature is below zero (referring also to para. 5.5). Do not exceed the nominal operating pressure of the circuit components.
- Bleed air out of the circuit.

NOTES:

- To avoid stratification run the circulation pump for at least 30 min. after adding any glycol.
- After adding water to the water circuit, **disconnect the unit from the sanitary water piping system;** in this way the water mixed with glycol won't return into the same piping system.
- After any topping—up of water check the glycol concentration and add any glycol if necessary.
- The hydraulic features of the system vary by adding glycol. Therefore check the head and the flow rate of the pump to be used.

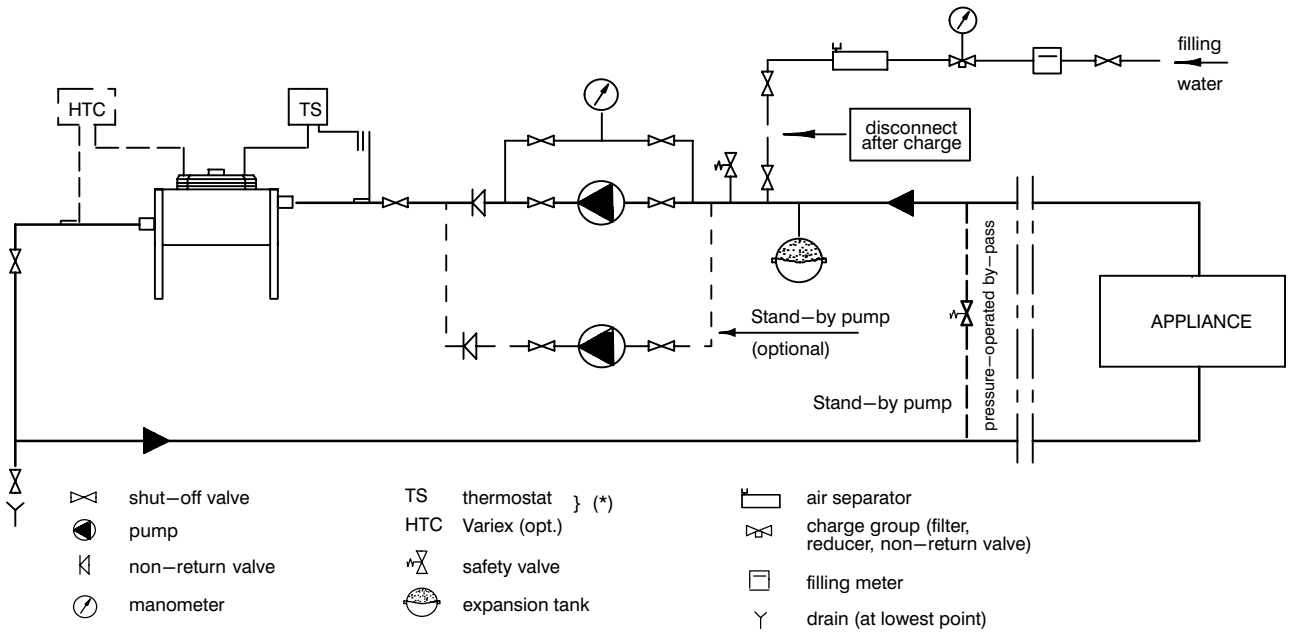
5.5 — Adding ethylene glycol

Tab. f — Ethylene glycol to be added to water

freezing temperature (°C)	0	−5	−11	−18	−27	−39
ethylene glycol to add to water (% in weight of total mixture)	0	10	20	30	40	50

N.B. Values are for Shell antifreeze 402. For different brands check manufacturer's data.

Fig. f — Advised Dry cooler Installation



See hydraulic drawings in the Enclosures D.

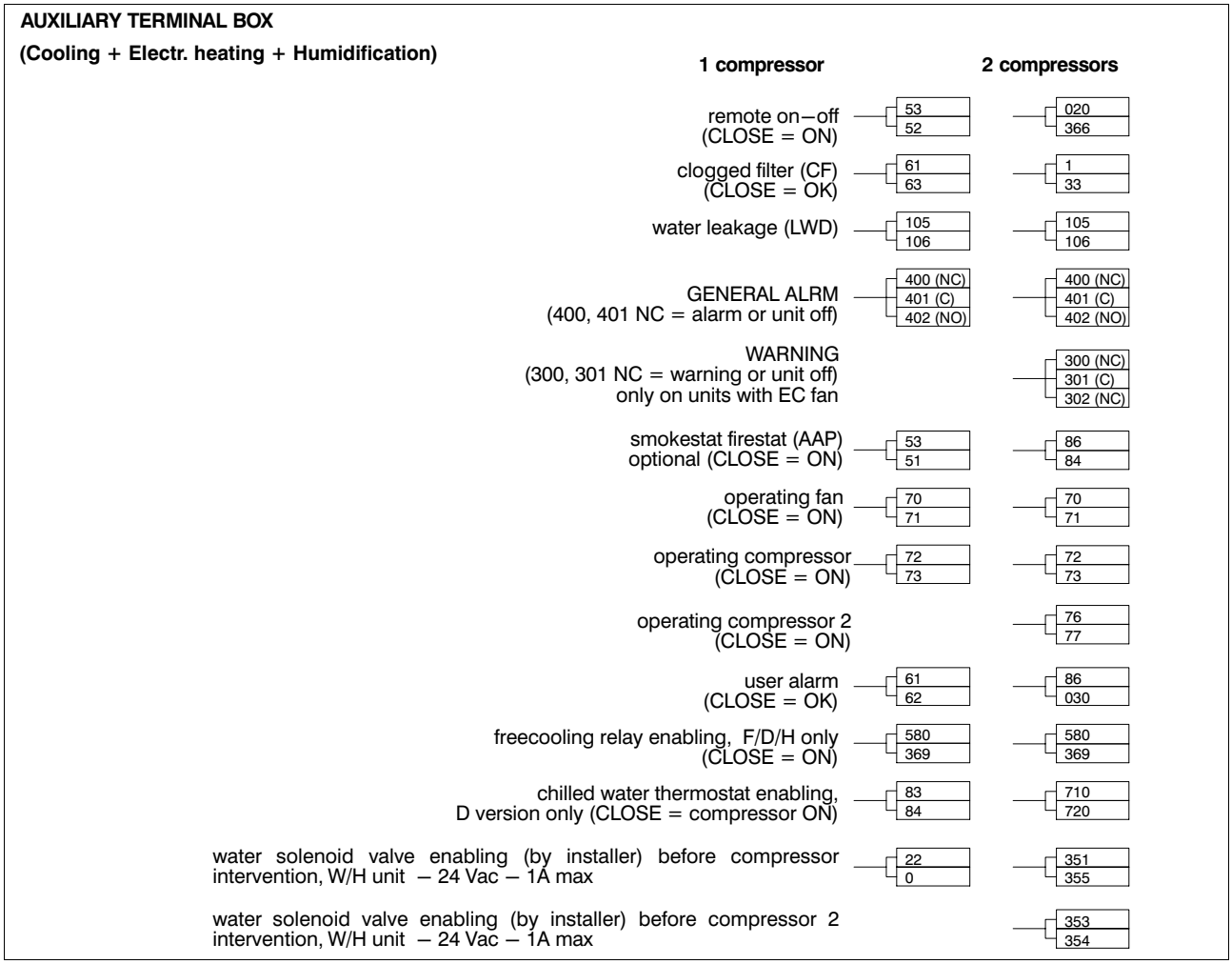
6 — Electrical connections

6.1 — Electrical connections

1) Before proceeding with the electrical connections, ensure that:
   - all electrical components are undamaged;
   - all terminal screws are tight;
   - the supply voltage and frequency are as indicated on the unit.
2) Power supply cable connections:
   - Connect the cable to the Line inlet terminal board.
   - Use the cable size defined according to the flow, the supply voltage and the installation type.
   - Protect the supply using a back—up fuse.
   - Do not fit the supply cable in the raceways inside the machine electric board.
   - Use multipolar cables with sheath (CEI20—22) only.
3) Wiring connections (Fig. g):
   - Connections for remote on—off and hot water consent must be done by the installer.
   - According with compressor running, two terminals for the opening of a water solenoid valve are available, by installer (W/H units).
   - The General Alarm terminals allow remote alarm signalling.
4) In case of short circuit, check the sticking of the involved switch and possibly replace it.

See electrical data in Enclosures B: Technical data tables.

Fig. g — Electrical connections



6.2 — Fan connections

The fan is electrically feeded by 1 or 2 autotransformers that are connected in order to obtain the nominal air flow and the External Static Pressure (ESP: 20 Pa for Under and 50 Pa for Over).
To change the factory connection proceed as follow:

— identify the unit's aeraulic graph in the Product Documentation;
— choose the curve's point where both the air flow and the static pressure are the most suitable for the installation;
— check the factory fan blocks connection and correct it, if necessary (see electrical diagram);
— choose the new output fan connections and connect the wires to the relevant blocks.

6.3 — Protection degree IP2x check

After whole of the connections and installation works, comprising ceiling elements (plenum, ducting) and floor elements (base frame), check and verify the protection degree IP2x (protection against finger access, std. IEC 60364—1) at the boundary of the air conditioner.

6.4 — Protective features of EC fan (optional)

The EC fan has been provided with the following protective features:

- Over temperature of electronics
- Over temperature of motor
- Locked rotor protection

- Short circuit at the motor output

With any of these failures, the motor stops (electronically – no potential separation), the status relay is released.
NO automatic restart. To reset the alarm, power supply has to be switched off for min. 20s once motor is at standstill.

- Mains under–voltage detection:
  if mains voltage falls below 3ph/290Vac (typical value) for 5s minimum, motor will be swithed off (only by electronics, no potential separation), status relay is released.
  If mains voltage returns to correct values, the motor will restart automatically.
- Phase failure recognition:
  if one phase failes for 5s minimum, motor will be switched off (only by electronics, no potential separation), status relay is released.
  If all 3 phases return to correct values, the motor will restart automatically within 10–40s.

The power supply for an external speed setting potentiometer is short–circuit protected.
Motor is overload–protected via motor current limitation.
Warning! Leakage current of the motor is 7 mA roughly.

7 – Start–up

7.1 – **First start–up** (or after long standstill)

TO PREVENT COMPRESSOR DAMAGE THE CRANKCASE(S) MUST BE PREHEATED FOR AT LEAST 4 HOURS BEFORE CONDITIONER START–UP (FAILURE TO DO SO INVALIDATES THE GUARANTEE).

Start the air conditioner as follows:

1) Open all valves in the refrigeration circuit according to the instruction label attached to the valve.
2) *W, F and H only*: Open all valves in the water circuit according to the instruction label attached to the valve.
3) Ensure that the refrigerant charge is correct (see Chap. 4).
4) Using a leak detector, verify that there are no refrigerant leaks. If there are any, then repair the leak and recharge as described in Chap. 4.
5) At least 4 hours before start–up, close **QS** and **QF8** on the electrical panel.
   In the "*iCom*" control system factory setting the *stand alone* mode is standard. The *stand alone* mode gives the possibility of turning on the unit simply rotating the main switch on the electric panel. The **yellow** LED on the *iCom* case will light after turning on the unit, because of the presence of electric power.
   If the LED does not light up:
   - check the electric panel power supply;
   - check the protection devices (e.g.: thermal switches);
   - check the fuses.
6) Verify the operation of the crankcase heater.
7) Check that there are no water leakages.
8) *D and H only*: Bleed all air out of the chilled water circuit using the bleed valve on the chilled water coil.
9) If an external condenser or Dry cooler is installed, start it by supplying power to it.
10) Close all MCBs on the electrical panel.
11) Check the supply voltage on all phases.
12) Check the supply voltage on all phases for the external condenser or Dry cooler, if fitted.
13) ENSURE THAT THE COMPRESSOR HAS BEEN PREHEATED FOR AT LEAST 4 HOURS BEFORE STARTING THE UNIT.
14) Start the unit by pressing **ON OFF** (see Fig. h).
15) Check the electrical absorption of all components (see Chap. 6).
16) Check the electrical absorption of the external condenser/Dry cooler, *if fitted.*
17) **IMPORTANT – If the compressor makes a loud and unusual noise IT IS NECESSARY TO INVERT the electrical connections of the phases supplying the corresponding scroll compressor, which accepts only one direction of rotation.**
18) Ensure that the fans rotate in the correct direction (see arrow on fan).
    CAUTION: risk of contact with rotating devices.
19) Ensure that all control system settings are correct and that there are no alarms (see Control manual).
20) *W, F and H only*: Verify the water flow.
21) *W, F and H only*: For closed circuit units ensure that the water pump starts when the compressor starts.
22) Verify the Fresh Air Intake operation *(if fitted)*.
23) Once the system is operating under load, check the various components, as follows:
    - Verify that the fans are operating properly.
    - Ensure that the temperature and relative humidity are being controlled, and that the humidifier *(optional)* and heating steps *(optional)* operate when required.
    - Ensure that the compressor operates when required.
    - *D and H only*: Ensure that chilled water valve operates when required.
    - Ensure that the fan operation controller on the external condenser/Dry cooler *(if fitted)* is calibrated correctly, and that it controls the fan operation.

7.2 – Starting and stopping

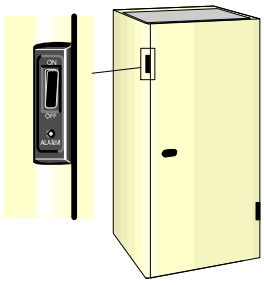
- ALWAYS ENSURE THAT EACH CRANKCASE HAS BEEN PREHEATED.
  FOR BRIEF STOPPAGES KEEP THE SUPPLY TO THE CRANKCASE HEATER.

Turn on the unit operating on the ON/OFF switch placed on the left case of the unit (Fig. h). If the ON/OFF remote device is not installed, the green LED on the *iCom* case will light up together with the LED placed below the ON/OFF switch. The fan starts immediately (the fan always works when the unit is ON); after 2 minutes the regulation is activated, so the cooling (compressor), heating (electric heaters), humidifying and dehumidifying devices can start.
Adjust the set–point as indicated in **Control manual.**
Stop the unit putting the ON/OFF switch in OFF.

7.3 – Automatic restart

If desired, the unit will automatically restart on the return of power after a supply interruption (see Control manual).
If the power interruption is expected to be of several hours, to avoid an automatic cold restart of the compressor stop the unit before the black–out and, on the return of power, allow the compressor to preheat before restarting the unit.

Fig. h – On–Off switch



7.4 — Checking the refrigeration piping pressure drops

Liebert HPM is equipped with connections to check the refrigeration piping pressure drops:

room unit → condenser → room unit

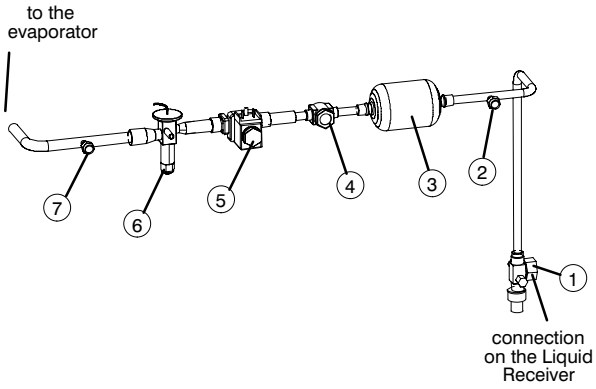
To carry out this operation it is necessary to use 2 calibrated manometers and connect them as follows:
M1, connected to the compressor delivery valve;
M2, connected to theSchrader valve (2) of Fig. i.
When the compressoris ruuning, check M1 and M2.

N.B.: Repeat this test , inverting the manometers : tocalculate the correct Δp consider the average value of the two readings.

Refrigeration pipeline Pressure drops (Δp bar), at 45°C (approx. R407C = R22):

- At the same geodetic level: Δp (bar) = M1−M2
- When condenser is above the room unit:
  Δp (bar) = M1−M2+geodetic difference (m x 1,1:10,2)
- When condenser is below the room unit:
  Δp (bar) = M1−M2−geodetic difference (m x 1,1:10,2)

Fig. i — Refrigerant line components



1	Liquid receiver valve
2	Filter dryer inlet Schrader valve
3	Filter dryer
4	Sight glass
5	Solenoid valve
6	Thermostatic expansion valve
7	Evaporator inlet Schrader valve

8 — Operation

Unit operation is completely automatic. The below sequence explains how the unit operates :

- The air, sucked in by the fan(s), enters the unit.
- The air is immediately filtered.
- The TEMPERATURE sensor or HUMITEMP (temperature + rel. humidity) sensor (check type installed), verifies the state of the inlet air, and relays this information to the control system.
- Filtered new air is injected into the air stream via the Fresh Air Intake (optional).
- The treated air passes through the fans, which operate continuously, and is then dispersed out of the unit.
- *Under unit only:* the air passes from the underfloor void into the room via air distribution outlets.

For "UNDER" units installed on raised floor: switch off the machine before removal of the floor panels within a distance of 850 mm from the machine, to avoid risks of contact with rotating devices (fans) moving and with hot heating elements. (see Fig. j).

- The control system compares the relayed information to the set point and proportional band values programmed into its memory: it then commands the air conditioner to treat the air as follows (see also Control manual):

- **COOLING**

  Direct expansion mode (DX)
  The compressor is started and the cold refrigerant flows through the evaporator, thus cooling the air passing over it. For compressor operation see Control manual.

- **HEATING**
  This can take one of three forms:
  — electrical heating *(optional)*: the heating elements heat the air passing over them. There are 3 heating steps.
  — hot water heating *(optional)*: if hot water is available, this flows through the hot water coil, thus heating the air passing over it. The hot water flow is controlled by an on−off (3−way) valve.
  — hot gas reheat (*optional* used during dehumidification): the hot refrigerant which exits the compressor flows through the hot gas coil, thus heating the air passing over it.

- **DEHUMIDIFICATION — *optional***

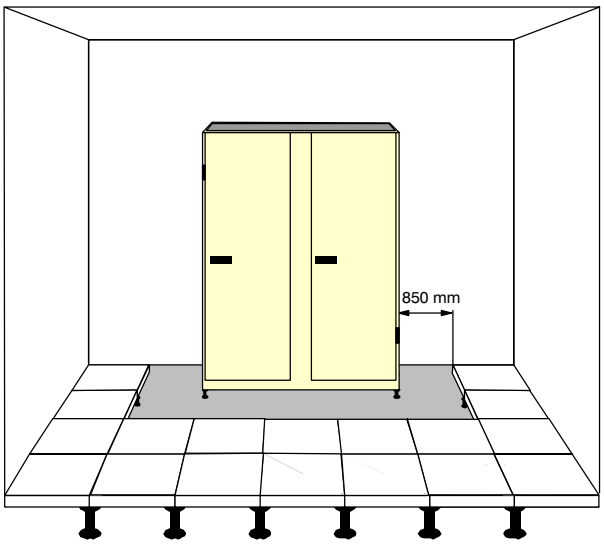
  DX mode
  One of the compressors starts and either the air flow or the evaporator surface is reduced (depending on the model), thereby causing dehumidification (refer also to Control manual).
  *In freecooling mode: see Control manual***.**

  N.B.: If, during dehumidification, the ambient temperature drops below a specified level, dehumidification will be stopped if necessary (see LOW LIMIT intervention in Control manual).

- **HUMIDIFICATION — *optional***
  The humidifier creates steam, which is distributed into the air stream via the steam distribution pipe (see also Enclosure A).

N.B.: Manual control can be performed using the control system (see Control manual).

Fig. j — Floor panels removal on a safety way



9 — Calibrations & Regulation (at start—up)

The air conditioner has already been factory—tested and calibrated, but it is very important to check, at start—up, the superheating of thermostatic valve (all versions) and the by—pass hot gas valve (F/D/H/KA/KW).

See Tab. 5 and Tab. 6 (Enclosed B) that show all valves.

- The air conditioner has already been factory.
- For calibrations of instruments installed on the external condensers/Dry coolers refer to the relevant manual.
- For control system calibrations refer to Control manual (to prevent erratic operations do not use temperature and rel. humidity set points/proportional bands which differ excessively from the Standard Settings).

9.1 — Setting the thermostatic expansion valve

THIS OPERATION MUST BE PERFORMED BY AN EXPERIENCED REFRIGERATION TECHNICIAN.

The valve has been factory preset and, if necessary, should be reset as follows:

1) IMPORTANT: Ensure that the instructions in Chap. 4 have been carried out.
2) Allow the compressor to operate for 15 mins.
3) Measure the superheat as follows:
   a) Place a contact thermometer on the tube exiting the evaporator;
   b) Connect a manometer (by a tube of max. 30 cm) to the compressor suction valve.
   c) The overheating is the difference between the refrigerant saturation temperature corresponding to the pressure read on the manometer and the real temperature read on the thermometer.
4) The superheat must be 5—8 K; if not, set the expansion valve as follows:
   a) Remove the protective cover;
   b) Turn the adjustment screw by 1/4 turn only;
   c) Wait 10 minutes.
   d) Measure the superheat and repeat the operation if necessary.

   N.B.: If the superheat is too low (compressor cool to the touch) the screw must be turned in a clockwise direction. If the superheat is too high (compressor hot to the touch) the screw must be turned in a counterclockwise direction.

9.2 — Adjustment of the hot gas injection valve as antifreeze mode and partial control of the capacity (F, D, H and Constant)

THIS OPERATION MUST BE CARRIED OUT BY AN EXPERT REFRIGERATION TECHNICIAN.

9.2.1 — Features

This valve is installed int some special versions (see relevant refrigeration circuits). It enables a partial control of the evaporating pressure, so as to avoid evaporation temperatures lower than zero degrees centigrade and thus any ice formation (chilled water side), even with low temperatures of the return air. It injects hot gas exiting the compressor before the evaporator through the gas—liquid mixer, so as to keep the pressure higher than the set value. See the refrigeraton diagram.

9.2.2 — Adjustment

The min. evaporating pressure is kept by calibrating the valve as follows.

- Drastically reduce the conditioner air delivery.
- Check by a precise pressure gauge the evaporating pressure and the relevant saturation temperature.
- Adjust the valve acting on the adjustment screw, so that it intervenes when the evaporation temperature has decreased to 2°C.
- Then check the correct operation of the thermostatic expansion valve.

9.3 — Chilled water valve *(F, D and H only)*

The 2—way (F) or 3—way (D/H) valve controls the chilled water flow and operates as follows (Fig. k):

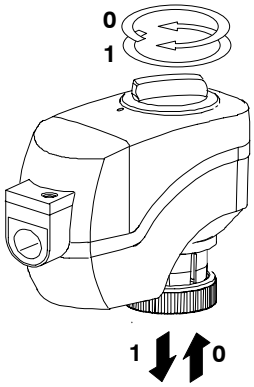
- When the valve is fully open (i.e. max. chilled water flow) the actuator slot is set to '1'.
- When the valve is closed (i.e. no chilled water flow) the actuator slot is set to '0'.

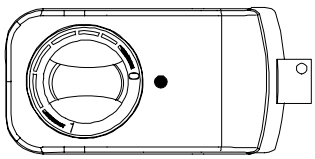
The valve running time is set to the value specified in the Control Manual.

Note 1: In the unlikely event of control system failure, the valve can be manually controlled by means of the rotary knob. It can be used to drive the actuator into any position between 0 and 1.

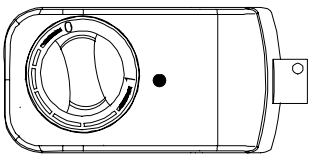
Note 2: When actuator stem is completely down, the valve is open and chilled water coil is supplied.

Fig. k — Position of the chilled water valve actuator (for 2 or 3—way valve)





Position indicator on
0 = CLOSED valve
(3—way valve: by—pass open)



Position indicator on
1 = OPEN valve
(3—way valve: by—pass closed)

9.4 – Water condenser flow control valve (F only)

Solenoid 2–way –Fig.K shown– valve, controls the plate condenser water–flow. This valve is equipped with a hand driven opening system, and a closing–speed control.
Opening hand drive can be used when a main control failure occurs, and is made by a cylindrical headed screw (screw 1) which has two position:

Closed – (valve closed) if letter "C" is turned upside;

Open – (valve open) if letter "A" is turned upside.

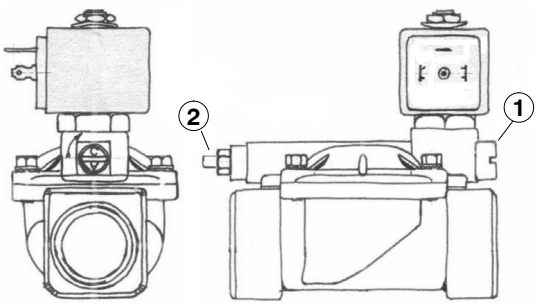
When from the "Closed" position the screw is turned to the "Open" position (no matter if in clockwise or counterclockwise direction) the valve is completely opened. In order to close the valve again it's necessary to turn again the screw to the "Closed" position. When the hand drive is in "Closed" position the valve can open if the coil is energized. Is then possible to modify the closing times turning a setting screw (screw 2); the adjustment possibilities range from fully open position with maximum closing speed to fully closed position with valve always open.

9.5 – Water leakage sensor (Liquistat)

Due to high flooding alarm device sensitivity, to the end to avoid undesirable alarm signal because of few sporadic water drops, place the sensors at a minimum distance of 50 cm from the unit base perimeter.

This solution assures alarm intervention for real flooding risk only.

Fig. l – Regulation of water condenser flow control valve



9.6 – Environment protection

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage. Use the freecooling function, if available.

10 – Maintenance / Spare Parts

10.1 – Safety instructions

All maintenance operations must be carried out strictly observing the European and National accident prevention regulations. We refer especially to the accident prevention regulations concerning electrical systems, refrigerators, and manufacturing resources.
Maintenance may be done to air conditioning equipment only by authorized and qualified technicians.
To keep all warrantees valid the maintenance must adhere to the manufacturer's regulations.

The work should be done in the system only when it is at standstill. Do this by switching off the air conditioner at the controller and the main switch. Post a warning sign saying: "DO NOT SWITCH ON."
Electrical components of device have to be switched off and be checked that they are not under voltage.

Ignoring the safety instructions can be dangerous to persons as well as to the environment.
Soiled parts always cause a loss of performance and for switch or control devices can lead to the break–down of a plant.

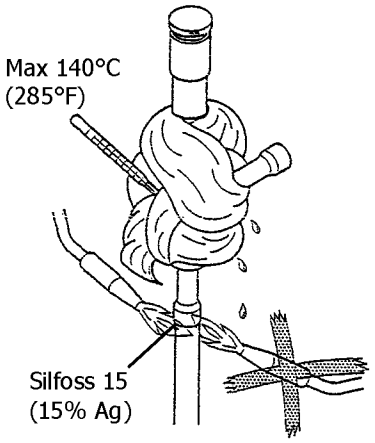
10.2 – Spare parts

Only original spare parts made by Emerson Network Power may be used. Using third–party material can invalidate the warrantee. When making inquiries always refer to the "Component List" supplied with the equipment and specify the model number, serial number and, if available, the part number as well.

NOTES:

1) When a faulty component is replaced, follow the relevant manufacturer instructions.
2) When the spare parts must be welded, be carefully do not damage the internal parts (gaskets, seals, o–rings, etc.).
   See, as an example, Fig. m.

Fig. m – CPCE valve



10.3 – Maintenance schedule

Monthly, quarterly, biannual and annual checks to be conducted according to the following guidelines.
All tasks and periods listed here are regulations from the manufacturer and need to be documented in an inspection report.

All these tasks should be carried out only by an authorized and trained technician. We recommend the Emerson Network Power Customer Service

Maintenance schedule

COMPONENT		MAINTENANCE PERIOD EVERY			
		1 Month	3 Months	6 Months	1 Year
FANS **Attention, do not reach into the fan while the fan wheel is running.**	Check for soiling, damage, corrosion, and proper fixing.	X			
	Check bearings noise.	X			
	Check blower balancing. Vibrations (mm/s).		X		
	Measure the current and power consumption.			X	
	Cleaning to preserve the function.		X		
AIR FILTERS	Check for soiling, damage, corrosion.	X			
	Check state of filter.	X			
	Clean or replace if necessary.	X			
	Carry out controls more frequently in dusty environments.	X			
NEW AIR FILTER *(if installed)*	see air filter. Clean or replace	X			
CONTROL SYSTEM	Check for proper and functionally correct installation and surrounding conditions.	X			
	Check the function of the LEDs of the display's control system and the alarms.		X		
	Check the connections for electrical and mechanical function.			X	
	Check the functional elements (e.g. operational controls and display devices).			X	
	Check the electrical/electronic and pneumatic input signals (e.g. sensors, remote controllers, command variable) for compliance with nominal values.			X	
	Check control function, control signals, and safety chains.			X	
	Adjust control function and control signals.			X	
HUMIDIFIER *(if installed)*	See appendix A.				
SWITCH CABINET POWER CIRCUITS **Attention, electrical cables and electrical components of the air conditioner are under voltage.**	Check the power supply on all phases.			X	
	Check the connections for electrical and mechanical function.			X	
	Check the power supply at all terminals.			X	
	Measure power consumption at all connected consumers.			X	
	Set, adjust, and tighten the functional elements (e.g. operational controls and display devices).			X	
	Check safety equipment, e.g. thermal switch.			X	
	Replace fuses (every 2 — 3 years)				X
	Check protective covers for completeness.				X
COOLING WATER *(W, F and H only)*	Check cooling water circuit.	X			
	Check for damage, leaks, and proper fixing.	X			
	Make sure there is no loss of water.				
COOLING WATER *(W, F and H only) Only for closed circuits:*	Make sure that the water pump works properly.			X	
	Deaerate circuits.			X	
	Check whether the heat transfer medium of circuit—connected system is frost—proof.			X	
	Check safety equipment for function.				
	Check glycol% comparing minimum yearly ambient temperature.			X	
REFRIGERATION CIRCUIT **Fluoride refrigerants increase the green—house effect and are subject to restrictions and norms, according to the national and European regulations.**	Measure the working pressures and temperatures (to be done by a refrigeration technician).			X	
	Check the power consumption, measure head temperature, and check for possible abnormal operating sounds.			X	
	Make sure that there is no frost building up on the evaporator and compressor.		X		
	Check function of all regulating devices (power regulators, valves, etc.).	X			
	Check safety devices for function.			X	
	If the quantity of refrigerant is not enough, it needs to be reclaimed and refilled with completely new refrigerant.				
	Check oil level at the sight glass.		X		
	Carry out an oil test.				X
	Change the oil after every 8000 hours of operation.				X
	Check valves and replace if necessary on industrial piston compressors (every 2 years).				X
	Check crankcase heater for function.			X	
EXTERNAL CONDENSER/ Dry cooler *(if installed)*	See appropriate manual.				

COMPONENT		MAINTENANCE PERIOD EVERY			
		1 Month	3 Months	6 Months	1 Year
CHILLED WATER CIRCUIT *(D and H only)*	Make sure there is no loss of water.			X	
	Deaerate the cooling water circuit using the vent valve on the top right hand side of the cooling coil.			X	
	Check that the cold water supply is ensured.			X	
	Check the temperature and the pressure of the water on the inlet and outlet side using thermometers and manometers if installed.			X	
	Check the proper function of the three−way valve.			X	
	Make sure that the system is filled with the prescribed amount of glycol and that there is no frost in the hydraulic circuit.			X	
	In case water loss needs to be refilled make sure the glycol concentration is correct.			X	
	Check that the water circulation is in perfect order.			X	

10.4 − Refrigeration circuit

WHEN REPAIRING THE REFRIGERATION CIRCUIT COLLECT ALL REFRIGERANT IN A CONTAINER: DO NOT ALLOW IT TO ESCAPE.

- When either removing (for repairs) or charging refrigerant this must always be done on both the high and low pressure sides of the compressor simultaneously.
- The compressor copper plated steel connections should be welded with a silfos material containing a minimum of 5% silver.

10.4.1 − Refrigerant charge of the water−cooled units *(W, F and H)*

1) Start the unit as described in para. 7.1.
2) Manually start the compressor (ensure the unit is not in dehumidification).
3) Wait a few minutes to allow conditions to stabilize.
4) Check the refrigerant circuit using a leak detector. If there is a leak recharge the unit until the working conditions of the entire refrigeration circuit have become normal.
5) Using a manometer, check that the evaporating temperature is above 0°C.
6) Verify the water pressostatic valve (WV) setting (CHAP. 8).
7) Verify that the superheat is 5−8 K (to do this refer to Chap. 8).

10.4.2 − Oil charge R407C

The oil to be used when topping up (only if there are any leaks) is EMKARATE RL 32−3MA or Mobil EAL Arctic 22CC (see Tab. g and Tab. h).

Tab. g − EMKARATE RL 32−3MA oil (for R407C only)

Viscosity at 40 °C	:	31.2 cSt
Viscosity at 100 °C	:	5.6 cSt
Viscosity index (ISO Grade)	:	32

Tab. h − Mobil Arctic EAL 22CC oil (for R407C only)

Density (at 15 °C)	:	0.967 kg/l
Flash point (C.O.C.)	:	245 °C
Pour point	:	<−54 °C
Viscosity at 40 °C	:	23.6 cSt
Viscosity at 100 °C	:	4.7 cSt
Viscosity index (ASTM D2270)	:	130

These oils rapidly absorb the humidity present in the air when they are exposed to the atmosphere.
If the oil absorbs humidity, the ester molecules can break down, forming acidity.
We therefore recommend exposing the oil for as short a time as possible (no more than a few minutes) and, in case of topping up, using exclusively the oil indicated on the refrigerating compressor.
Normally 1 or 2−litre cans are available for this purpose; once they are opened, they must be completely used up. They must not be used after a long period, as they absorb humidity.
It is therefore obvious that the taps of the compressor must only be turned after the whole plant has been subjected to a vacuum and partial filling.

10.4.3 − Oil charge R22

The oil to be used when topping up (only if there are any leaks) is SUNISO 3GS.

Tab. i − Suniso 3GS oil (for R22 only)

Density (at 15 °C)	:	0.91 kg/l
Flash point (C.O.C.)	:	178 °C
Pour point	:	<−40 °C
Viscosity at 40 °C	:	29,5 cSt
Viscosity at 100 °C	:	4,35 cSt
Coppoer corrosion (100 °C, 3 hr) ASTM D130	:	1
Neutralization value	:	0,03 máx.
Dielectric strenght	:	> 30kV

10.4.4 − Oil topping−up of an installed circuit

If oil leakages occur, the topping−up operation is necessary. (Contact the local Service before intervention).

10.4.5 − Compressor removal (only L units)

If the innermost compressor is faulty, a few steps must be carried out to ensure an easy replacement (see Fig. 1 − Enclosure G).

10.5 − Dismantling the unit

The machine has been designed and built to ensure continuous operation.
The working life of some of the main components, such as the fan and the compressor, depends on the maintenance that they receive.

The unit contains substances and components hazardous for the environment (electronic components, refrigerating gases and oils). At the end of the useful life, when the unit is dismantled, the operation must be carried out by specialized refrigerating technicians. The unit must be delivered to suitable centers specialized for the collection and disposal of equipment containing hazardous substances.

10.6 — Regulation (EC) no. 842/2006 (F—gas)

Stationary air conditioning placed into the European Community market and operating with fluorinated greenhouse gases (f—gas), such as R407C, R134a, R410A, they have to comply with the F—gas Regulation (applied since 04 July 2007).

(Be aware that refrigerants as R22 are not f—gas and their relevant regulation is Reg. (EC) no. 2037/2000).

Following notes have to be considered when operating with the above mentioned equipments.

- **Fluorinated greenhouse gases are covered by the Kyoto Protocol.**
- **The fluorinated greenhouse gases in this equipment should not be vented to the atmosphere.**
- Referring to the value noted in Annex I of Regulation (EC) No 842/2006
  here below **the global warming potential (GWP)** of some major f—gases

R—134a	GWP	1300
R—407C	GWP	1610
R—410A	GWP	1890

- **Operators of the above mentioned applications**, which contain fluorinated greenhouse gases, shall, using all measures which are technically feasible and do not entail disproportionate cost:
  a. prevent leakage of these gases and as soon as possible repair any detected leakage.
  b. ensure that they are checked for leakage by certified personnel.
  c. ensure for putting in place arrangements for the proper recovery by certified personnel.
  d. In case of applications containing 3 kg (6kg in case of hermetically sealed system) or more of f—gases: certified personnel provides regular leak testing (according to Reg. 1516/2007 and Reg. 1497/2007) and maintain records of maintenance activities in a dedicated log book.
  e. **Recovery for the purpose of recycling, reclamation or destruction of the fluorinated greenhouse gases, pursuant to Art.4 (Recovery) of Reg.842/2006, shall take place before the final disposal of that equipment and, when appropriate, during its servicing and maintenance.**
- **Operator**, according to Reg. 842/2006, Article 2, point 6, means the natural or legal person exercising actual power over the technical functioning of the equipment and system covered by the Regulation. The State may, in defined, specific situations, designate the owner as being responsible for the operator's obligations.
- **Direct methods of leakage checking approved by the manufacturer (Reg. 1516/2007 and Reg. 1497/2007)**
  a. gas detection device adapted to the refrigerant in the system; the sensitive of portable gas detection devices (as a direct test method) shall be at least five grams par year.
  b. proprietary bubble solutions / soapsuds.
- **Additional information located into a dedicated label of unit (Reg. 1494/2007)**
  a. Where fluorinated greenhouse gas is foreseen to be added to the equipment outside of the manufacturing site at the point of installation, a dedicated label accommodates notation of both the quantity (kg) pre—charged in the manufacturing plant and of the quantity charged at the installation site as well as the resulting total quantity of f—gas as a combination of the above mentioned quantities, in a manner which conforms to the legibility and indelibility.
  Our split units are usually not pre—charged on factory, in this case the total quantity of refrigerant charged in the unit has to be written in the relevant label, during the commissioning operation at the installation site.
  b. Our packaged units (not split) operating with f—gas are usually full charged on factory and the total amount of refrigerant charge is already reported on the label. In this case, the label has no need of further written information.
  c. In generally, the above mentioned information has been located in the main nameplate of relevant unit.
  d. For equipment with double refrigeration circuits, in regards to differentiates requirements on the basis of the quantity of f—gas contained, the required information about refrigerant charge quantities has to be listed separately for each individual circuit.
  e. For equipments with separate indoor and outdoor sections connected by refrigerant piping, the label information will be on that part of the equipment which is initially charged with the refrigerant. In case of a split system (separate indoor and outdoor sections) without a factory pre—charge of refrigerant, the mandatory label information will be on that part of the product or equipment which contains the most suitable service points for charging or recovering the fluorinated greenhouse gas(es).
- **Safety data sheets of f—gases** used into the products are available on demand.

App. A - HUMIDAIR humidifier

A.1 - Preface

The HUMIDAIR represents the best humidifier technology available, guaranteeing the steam as clean as possible together with simple maintenance.

In order to obtain optimum performance from the HUMIDAIR it is advisable to read this manual carefully.

Tab. a - Humidair specifications

HPM MODEL	HUMIDAIR MODEL	MAIN POWER SUPPLIES (V ± 10%)	SETTING [kg/h] *	ABSORBED CURRENT [A]	POWER [kW]	MAX. CYLINDER WATER VOLUME [l]	MAX. SUPPLY WATER QUANTITY [l/min.]	MAX. DRAIN WATER QUANTITY [l/min.]
S04-05	**KUECLA**	230V / 1ph / 50Hz	0.6...2.0	6.5	1.5	1.7	0.6	4.0
S07...12	**KUECLB**	400V / 3ph / 50Hz	1.3...4.5	4.6	3.0	3.3	0.6	4.0
S07...12	**KUECLC**	230V / 3ph / 50Hz	1.3...4.5	8.0	3.0	3.3	0.6	4.0
S13...23 M25	**KUECLD**	400V / 3ph / 50Hz	2.7...9.0	9.0	5.8	5.5	0.6	4.0
S13...23 M25	**KUECLE**	230V / 3ph / 50Hz	2.7...9.0	15.6	5.8	5.5	0.6	4.0
M31...66	**KUECLD**	400V / 3ph / 50Hz	3.9...13.0	13.0	9.0	5.5	0.6	4.0
M31...66	**KUECLE**	230V / 3ph / 50Hz	3.9...13.0	22.5	9.0	5.5	0.6	4.0
L83-99	**KUECLD**	400V / 3ph / 50Hz	3.9...13.0	13.0	9.0	5.5	0.6	4.0
L83-99	**KUECLE**	230V / 3ph / 50Hz	3.9...13.0	22.5	9.0	5.5	0.6	4.0

Tab. b - Humidair specifications for Displacement unit

HPM MODEL	HUMIDAIR MODEL	MAIN POWER SUPPLIES (V ± 10%)	SETTING [kg/h] *	ABSORBED CURRENT [A]	POWER [kW]	MAX. CYLINDER WATER VOLUME [l]	MAX. SUPPLY WATER QUANTITY [l/min.]	MAX. DRAIN WATER QUANTITY [l/min.]
S04-05 D	**KUECLA**	230V / 1ph / 50Hz	0.6...2.0	6.5	1.5	1.7	0.6	4.0
S07...12 D	**KUECLB**	400V / 3ph / 50Hz	1.3...2.0	2.0	1.3	3.3	0.6	4.0
S07...12 D	**KUECLC**	230V / 3ph / 50Hz	1.3...2.0	3.6	1.3	3.3	0.6	4.0
S13...23 D M25 D	**KUECLD**	400V / 3ph / 50Hz	2.7...4.5	4.6	3.0	5.5	0.6	4.0
S13...29 D M25 D	**KUECLE**	230V / 3ph / 50Hz	2.7...4.5	8.0	3.0	5.5	0.6	4.0

For humidifier current (FLA) and rated power, refer to electrical features in the air conditioner manual.
(*) Unit is factory-set to produce about 70% of the maximum value (see iCom manual).

A.2 - Installation

The humidifier is supplied already mounted within the air conditioner. The only necessary operations are the connections for the supply water (Fig. a) and drain water (Fig. b).

Fig. a - Supply water connection

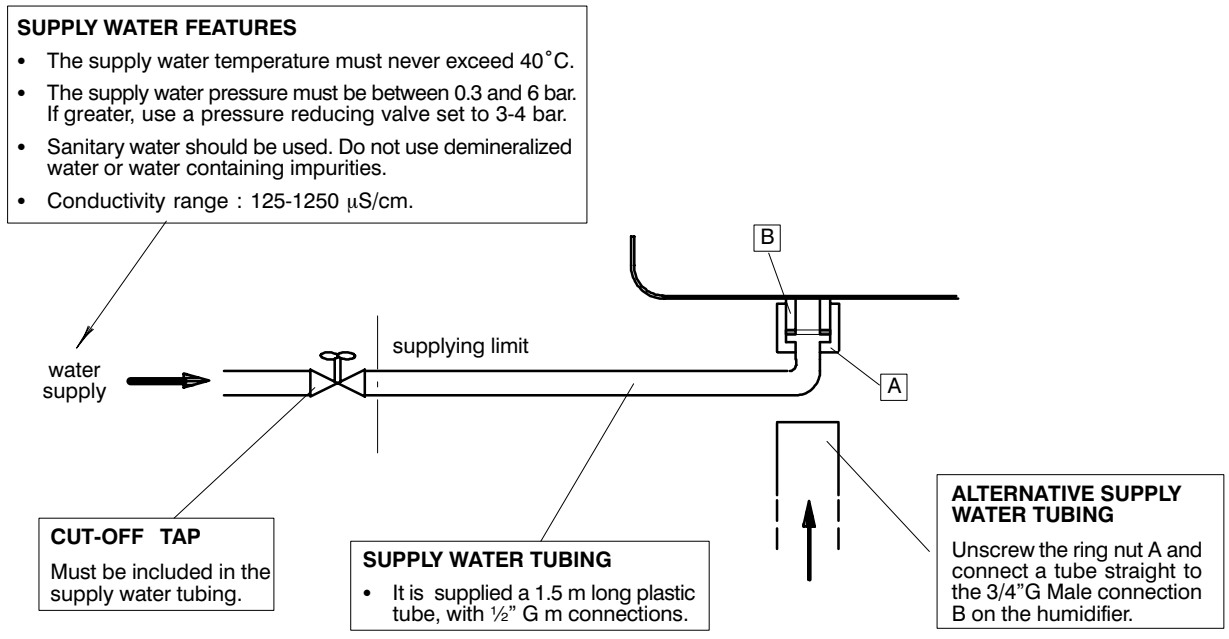
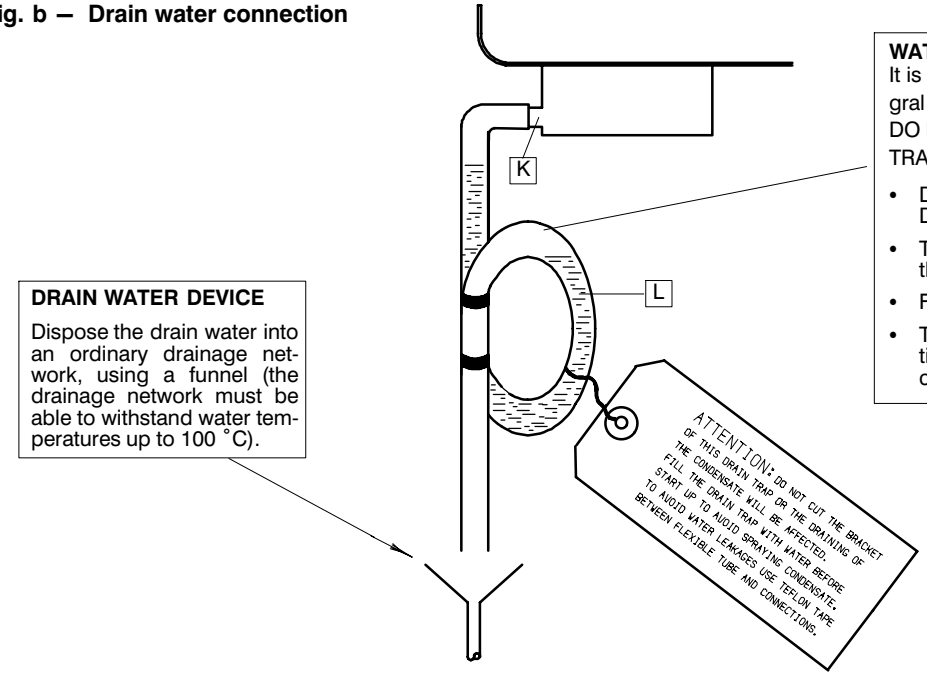


Fig. b — Drain water connection



DRAIN WATER DEVICE

Dispose the drain water into an ordinary drainage network, using a funnel (the drainage network must be able to withstand water temperatures up to 100 °C).

WATER DRAIN TUBING

It is supplied a hose with an integral drain trap.

DO NOT DISMANTLE THE DRAIN TRAP.

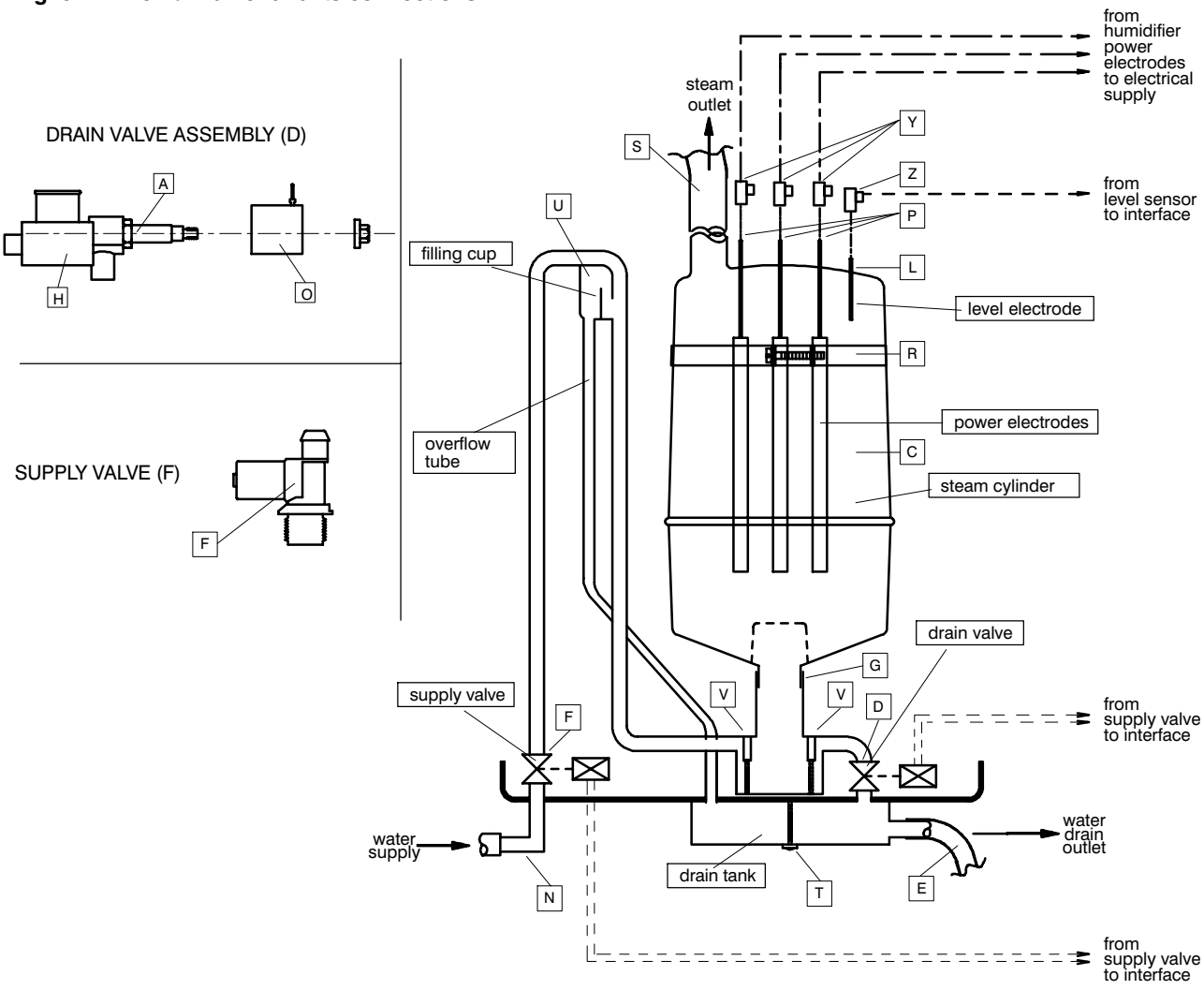
- DO NOT DISMANTLE THE DRAIN TRAP.
- The hose is already fitted onto the humidifier drain outlet (K).
- Fill the drain trap with water (L).
- The drain pipe is made of plastic material which does not conduct electricity.

NOTES:
1) Allow a 2% gradient towards the drain outlet.
2) Avoid back pressures in the drain piping.

A.3 — Humidair components

The components of the HUMIDAIR humidifiers are shown below.

Fig. c — The humidifier and its connections



A.4 — Start—up and operation

A.4.1 — Start—up

Before using the humidifier, check the following:

- Supply and drain connections.
- That the cut—off tap is open.
- All wiring.
- Earthing.
- Steam hose connection between steam cylinder and distributor.

To start the humidifier simply switch on the air conditioner, which will in turn automatically start and stop the humidifier as required. The (adjustable) parameters which determine humidifier operation have already been factory—preset (see iCom manual).

A.4.2 — Operation

Water, provided it contains even a small quantity of salts in solution, is a conductor of electricity. Therefore, if the steam cylinder is filled with water and a potential difference is applied between the electrodes, the water behaves like an ordinary electrical resistance and becomes hot, thus creating steam.
The steam production rate can be controlled by varying the water level in the cylinder; the higher the water level, the deeper the electrodes are immersed into it and the greater the steam production.

Note 1

In case of low water conductivity consult HPAC Technical Sales Support.

Note 2

When starting with an empty cylinder, the water conductivity is **normally** insufficient for the HUMIDIFIER STEAM OUTPUT to be reached immediately.
Therefore the humidifier produces as much steam as possible to fill the cylinder completely. Any evaporation water is immediately refilled.
The drain valve is kept shut and therefore, as the steam does not contain any salts, the conductivity of the water within the cylinder slowly increases until the HUMIDIFIER STEAM OUTPUT is obtained.
The length of the start—up period depends upon the water conductivity. For very conductive water it may occur that the HUMIDIFIER STEAM OUTPUT is obtained immediately.

A.5 — Maintenance

A.5.1 — Removing the steam cylinder

To remove the steam cylinder, proceed as follows (see Fig. c):

1) Open the General Switch relative to the humidifier.
2) Drain all the water from the cylinder by activating "**HUM. DRAIN**" in the CONTROL Service menu several times (see Control manual).
3) Disconnect the steam hose (S) (made of non—conductive rubber).
4) Disconnect the power electrode wires (P) and level sensor wire (L).
5) Undo the clip (R).
6) Pull the cylinder (C) out of its gland at the bottom (G).

A.5.2 — Replacing the steam cylinder

When the steam cylinder is approaching the stage where it needs to be replaced, warning **A25** is generated (see Control manual) to advise the user that the cylinder must be replaced. To replace the cylinder, proceed as follows (see Fig. c):

1) Carry out the instructions in para. A.5.1.
2) Using the new cylinder, carry out 4)—6) of para. 5.1 in reverse order.
3) Connect the steam hose (S); the clip on the hose needs to be tightened only slightly.
4) Manually switch the humidifier on for 2—3 minutes (in the iCom Service menu). Then switch it off.
5) Drain the water as for 2) in para. A.5.1.
6) If the air conditioner features a iCom CDL with Graphic display, reset the humidifier working hours (window no. 1 of **PARAMETER MENU**) to zero.
7) Close the General Switch relative to the humidifier.

A.5.3 — Annual maintenance

Annually (e.g. before any close—down period) carry out the following service on the humidifier (see Fig. c):

1) Carry out the instructions in para. A.5.1.
2) Disconnect the supply (F) and drain (D) valve wires.
3) Unscrew and remove the drain tank (T).
4) Unscrew the drain valve assembly screws (V).
5) Remove the drain valve assembly.
6) Unscrew and remove the drain valve solenoid (O).
7) Unscrew and remove the drain valve armature (D).
8) Clean all parts of the drain valve using a commercially available descaling agent (to remove any incrustations).
9) Detach the hose from the supply valve.
10) Remove the supply valve connection (N).
11) Unscrew the supply valve (F) and remove it.
12) Clean the supply valve using a jet of water.
13) Replace any hose which has become hard and brittle.
14) Thoroughly flush the drain line (E).
15) Reassemble the humidifier by carrying out the above instructions in reverse order.

ATTENTION

Always empty the cylinder completely before any close—down period.

A.6 — Humidifier spare part list

It is recommended the use of original spare parts. When placing an order quote the part code, as well as the air conditioner model no. and serial no.

POSITION (see Fig. c)	CODE	DESCRIPTION	Humidair Model KUExxx					Notes
			CLA	CLB	CLC	CLD	CLE	
C	141090	Steam cylinder CLA	1					(*)
	141091	Steam cylinder CLB		1				(*)
	141093	Steam cylinder CLC			1			(*)
	141092	Steam cylinder CLD				1		(*)
	141094	Steam cylinder CLE					1	(*)
T		Drain tank	1	1	1	1	1	
U		Filling cup	1	1	1	1	1	
K		Rubber gasket for drain tank	1	1	1	1	1	
F	183240	Complete supply valve	1	1	1	1	1	
A	183241	Drain valve armature	1	1	1	1	1	
H	183242	Drain valve housing	1	1	1	1	1	
O	254007	Drain valve solenoid	1	1	1	1	1	(*)
	254905	Isolator for level sensor	1	1	1	1	1	

(+) = Spare part recommended

(*) = Consumable material

Tab. 1 – Electrical data

Configuration	Model	Power supply	FLA [A]	LRA [A]	RESIDUAL–CURRENT CIRCUIT BREAKERS IΔn = 0.3A (400V)
Cooling *Fan + compressor*	S04xA/W	230 / 1 / 50 Hz	12.0	37	16A
	S05xA/W		13.0	49	16A
	S07xA/W	400 / 3N / 50 Hz	8.2	43	16A
	S10xA/W		9.6	49	16A
	S12xA/W		13.0	53	16A
	S13xA/W		13.0	53	16A
	S17xA/W/F/D/H		15.0	68	20A
	S20xA/W/F/D/H		17.0	79	25A
	S23xA/W/F/D/H		21.0	100	32A
	M25xA/W/F/D/H		21.0	100	32A
	M29xA/W		25.0	128	32A
	M31xA/W/F/D/H		26.0	129	32A
	M34xA/W/F/D/H		31.0	84	40A
	M35xA/W/F/D/H		28.0	133	40A
	M41xA/W/F/D/H		37.0	177	50A
	M42xA/W/F/D/H		34.0	96	50A
	M47xA/W/F/D/H		42.0	208	63A
	M50xA/W/F/D/H		41.0	121	50A
	M58xA/W/F/D/H		50.0	153	63A
	M66xA/W		54.0	159	80A
	L83UA/W/F/D/H		70.0	233	80A
	L99UA/W		76.0	236	80A
Cooling + Electrical heating *Fan + compressor + electrical heaters*	S04xA/W	230 / 1 / 50 Hz	18.0	43	25A
	S05xA/W		19.0	55	25A
	S07xA/W	400 / 3N / 50 Hz	15.0	49	20A
	S10xA/W		16.0	55	20A
	S12xA/W		19.0	59	25A
	S13xA/W		21.0	61	32A
	S17xA/W/F/D/H		24.0	77	32A
	S20xA/W/F/D/H		26.0	87	32A
	S23xA/W/F/D/H		29.0	108	40A
	M25xA/W/F/D/H		32.0	111	40A
	M29xA/W		36.0	139	50A
	M31xA/W/F/D/H		48.0	151	63A
	M34xA/W/F/D/H		40.0	94	50A
	M35xA/W/F/D/H		50.0	155	63A
	M41xA/W/F/D/H		59.0	199	80A
	M42xA/W/F/D/H		44.0	106	63A
	M47xA/W/F/D/H		64.0	230	80A
	M50xA/W/F/D/H		48.0	127	63A
	M58xA/W/F/D/H		52.0	155	63A
	M66xA/W		54.0	159	80A
	L83UA/W/F/D/H		70.0	233	80A
	L99UA/W		76.0	236	100A
Cooling + Electrical heating + Humidification *Fan + compressor + electrical heaters + humidifier*	S04xA/W	230 / 1 / 50 Hz	18.0	43	25A
	S05xA/W		19.0	55	25A
	S07xA/W	400 / 3N / 50 Hz	15.0	49	20A
	S10xA/W		16.0	55	20A
	S12xA/W		19.0	59	25A
	S13xA/W		22.0	62	32A
	S17xA/W/F/D/H		24.0	77	32A
	S20xA/W/F/D/H		26.0	88	32A
	S23xA/W/F/D/H		30.0	109	40A
	M25xA/W/F/D/H		32.0	111	40A
	M29xA/W		36.0	139	50A
	M31xA/W/F/D/H		48.0	151	63A
	M34xA/W/F/D/H		44.0	97	63A
	M35xA/W/F/D/H		50.0	155	63A
	M41xA/W/F/D/H		59.0	199	80A
	M42xA/W/F/D/H		47.0	109	63A
	M47xA/W/F/D/H		64.0	230	80A
	M50xA/W/F/D/H		54.0	134	80A
	M58xA/W/F/D/H		63.0	166	80A
	M66xA/W		67.0	172	100A
	L83UA/W/F/D/H		83.0	246	100A
	L99UA/W		89.0	249	100A

NOTES:

- The cables have to be sized in compliance with local standards and according to the type and characteristics (e.g. Amperes) of installation.
- The specific power of the user–installed switch, must be lower than 300,000 A^2 x s.
- Prescriptions on the differential relay required to the user:
  - for special places (healthcare facilities, etc...) comply with the local regulations;
  - For ordinary places, a low sensitivity is suggested (300 mA) coordinated with the value of the ground heater (IEC 364): Ra ≤ 50/Ia (Art. 413.1.4.1, CEI 64–8);
  - In case of frequent over–voltages with mains impulse, it is advisable to install a selective differential and to evaluate the need for adopting other devices.

Tab. 2 — Standard fan connections for Liebert HPM with autotransformer

Configuration	Model	Fan motor type/connection	Autotrasformer outlet voltage	
			Standard	Dehumidification Under / Over, K, G, L
UNDER (U) OVER (O) CONSTANT (K, L) GRILLE (G)	S04xA/W	1Ph. / —	140	120
	S05xA/W	1Ph. / —	160	140
	S07xA/W	1Ph. / —	170	130 / 150
	S10xA/W	1Ph. / —	200	170 / 185
	S12xA/W	1Ph. / —	215	185 / 200
	S13xA/W	3Ph. / Y	260	220
	S17xA/W	3Ph. / Y	290	260
	S20xA/W	3Ph. / Y	220	190
	S23xA/W	3Ph. / Y	290	260
	M25xA/W	3Ph. / Y	220	190
	M29xA/W	3Ph. / Y	290	260
	M31xA/W	3Ph. / △	220	190
	M34xA/W	3Ph. / △	260	220
	M35xA/W	3Ph. / △	260	220
	M41xA/W	3Ph. / Y	220	190
	M42xA/W	3Ph. / Y	220	190
	M47xA/W	3Ph. / Y	260	220
	M50xA/W	3Ph. / Y	260	220
	M58xA/W	3Ph. / Y	290	260
	M66xA/W	3Ph. / Y	330	290
	L83UA/W	3Ph. / △	330	290
	L99UA/W	3Ph. / △	360	330
UNDER (F/D/H) OVER (F/D/H)	S17xF/D/H	3Ph. / Y	290	260
	S20xF/D/H	3Ph. / Y	220	190
	S23xF/D/H	3Ph. / Y	290	260
	M25xF/D/H	3Ph. / Y	290	260
	M31xF/D/H	3Ph. / △	260	220
	M34xF/D/H	3Ph. / △	290	260
	M35xF/D/H	3Ph. / △	290	260
	M41xF/D/H	3Ph. / Y	260	220
	M42xF/D/H	3Ph. / Y	260	220
	M47xF/D/H	3Ph. / Y	290	260
	M50xF/D/H	3Ph. / Y	290	260
	M58xF/D/H	3Ph. / Y	330	290
	L83UF/D/H	3Ph. / △	330	290
DISPLACEMENT (D)	S04DxA/W	1Ph. / —	120	120
	S05DxA/W	1Ph. / —	140	120
	S07DxA/W	1Ph. / —	150	130
	S10DxA/W	1Ph. / —	185	170
	S12DxA/W	1Ph. / —	200	185
	S13DxA/W	3Ph. / Y	220	190
	S17DxA/W	3Ph. / Y	260	220
	S20DxA/W	3Ph. / Y	190	150
	S23DxA/W	3Ph. / Y	260	220
	M25DxA/W	3Ph. / Y	190	190
	M29DxA/W	3Ph. / Y	260	260

NOTES:

- To change the ESP (External Static Pressure) of the fan (20 Pa for Under and 50 Pa for Over) it is necessary to move the following wires:
  — R5—T5 e R4—T4 (dehumidification) on S13—17—20—23
  —160—120 (dehumidification) on S5—12.
- The motor fan for Liebert HPM S04—05—07—10—12 is single phase and no internal changes are requested.
- **Attention**: Do not modify **Y** connections to △.

Tab. 2b – EC optional fan connections

Model	UNDER (U)		OVER (O)		DISPLACEMENT (D)		CONSTANT (K)	
	Std	Dehumidification	Std	Dehumidification	Std	Dehumidification	Std	Dehumidification
	VDC	VDC	VDC	VDC	VDC	VDC	VDC	VDC
S13xA/W	6.5	5.5	6.5	5.5	6.5	5.5	6.5	5.5
S17xA/W	6.9	5.9	6.9	5.9	6.6	5.6	6.9	5.9
S20xA/W	7.3	6.3	7.3	6.3	7.0	6.0	7.3	6.3
S23xA/W	8.8	7.8	8.8	7.8	8.5	7.5	8.8	7.8
S17xF/D/H	7.0	6.0	7.0	6.0				
S20xF/D/H	7.5	6.5	7.5	6.5				
S23xF/D/H	9.0	8.0	9.0	8.0				
M25xA/W	8.0	7.0	8.0	7.0	7.0	6.0	7.5	6.5
M29xA/W	8.5	7.5	8.5	7.5	8.0	7.0		
M31xA/W	6.0	5.0	6.0	5.0				
M34xA/W	6.5	5.5	6.5	5.5				
M35xA/W	6.5	5.5	6.5	5.5				
M41xA/W	7.5	6.5	7.5	6.5				
M42xA/W	7.5	6.5	7.5	6.5				
M47xA/W	8.5	7.5	8.5	7.5				
M50xA/W	8.5	7.5	8.5	7.5				
M58xA/W	9.0	8.0	9.0	8.0				
M66xA/W	9.5	8.5	9.5	8.5				
L83UA/W	8.5	7.5						
L99UA/W	9.0	8.0						
M25xF/D/H	8.5	7.5	8.5	7.5				
M31xF/D/H	6.5	5.5	6.5	5.5				
M34xF/D/H	7.0	6.0	7.0	6.0				
M35xF/D/H	7.0	6.0	7.0	6.0				
M41xF/D/H	8.0	7.0	8.0	7.0				
M42xF/D/H	8.0	7.0	8.0	7.0				
M47xF/D/H	9.0	8.0	9.0	8.0				
M50xF/D/H	9.0	8.0	9.0	8.0				
M58xF/D/H	9.5	8.5	9.5	8.5				
L83UF/D/H	8.5	7.5						

NOTE:

The EC fan settings can be modified acting on the control display (see iCom manual)

Tab. 3 — Electrical data (standard component)

Compo-nent	FAN (3Ph — 400V: S13—S23) (1Ph — 230V: S04—S05—S07—S12)				COMPRESSOR (3Ph — 400V — 50Hz) (1Ph — 230V: S04—S05)								
					STANDARD R407C				MOTOR	OPTIONAL R22			
Model	OA*	FLA	LRA	Nominal power (kW)*	OA**	FLA	LRA	Nominal power (kW)**	Winding resistance (Ohm)	OA**	FLA	LRA	Nominal power (kW)**
S04xU/O	1.4	1.5	3.1	0.20	5.3	10.0	35.0	1.16	2.25	5.1	10.0	35.0	1.12
S05xU/O	1.4	1.5	3.1	0.23	6.8	11.4	47.0	1.45	1.62	6.6	11.4	47.0	1.40
S07xU/O	2.2	2.6	4.9	0.34	4.2	5.6	40.0	2.16	4.83	4.0	5.6	40.0	2.07
S10xU/O	2.3	2.6	4.9	0.40	4.8	7.0	46.0	2.51	4.03	4.6	7.0	46.0	2.42
S12xU/O	2.4	2.6	4.9	0.43	5.8	10.0	50.0	3.05	3.88	5.8	10.0	50.0	3.06
S13xU/O	2.6	2.8	9.9	0.87	5.7	10.0	50.0	2.97	3.88	5.7	10.0	50.0	3.00
S17xU/O	2.6	2.8	9.9	0.98	7.5	12.4	65.5	3.82	2.75	7.4	12.4	65.5	3.71
S20xU/O	4.6	4.8	19.0	1.50	7.9	12.1	74.0	4.38	2.27	7.8	12.1	74.0	4.32
S23xU/O	4.5	4.8	19.0	1.86	11.1	15.9	95.0	5.89	1.80	10.7	15.9	95.0	5.67
M25xU/O	4.7	4.8	19.0	1.52	11.1	15.9	95.0	5.89	1.80	11.1	15.9	95.0	5.7
M29xU/O	4.6	4.8	19.0	1.90	13.2	20.0	123.0	6.96	1.04	13.2	20.0	123.0	6.5
M31xU/O	5.7	6.0	23.0	1.99	13.1	20.0	123.0	6.94	1.04	13.1	20.0	123.0	6.5
M35xU/O	5.7	6.0	23.0	2.38	15.1	22.0	127.0	7.96	1.02	15.1	22.0	127.0	7.5
M41xU/O	2x4.7	2x4.8	2x19.0	2x1.51	17.6	27.0	167.0	10.00	0.83	17.6	27.0	167.0	9.3
M47xU/O	2x4.6	2x4.8	2x19.0	2x1.74	20.8	32.0	198.0	12.10	0.72	20.8	32.0	198.0	11.6
M34xU/O	5.7	6.0	23.0	2.38	2x7.5	2x12.4	2x65.5	2x3.82	2.75	2x7.5	2x12.4	2x65.5	2x3.7
M42xU/O	2x4.7	2x4.8	2x19.0	2x1.51	2x7.9	2x12.1	2x74.0	2x4.39	2.27	2x7.9	2x12.1	2x74.0	2x4.3
M50xU/O	2x4.6	2x4.8	2x19.0	2x1.74	2x11.1	2x15.9	2x95.0	2x5.90	1.80	2x11.1	2x15.9	2x95.0	2x5.7
M58xU/O	2x4.5	2x4.8	2x19.0	2x1.89	2x13.2	2x20.0	2x123.0	2x6.96	1.04	2x13.2	2x20.0	2x123.0	2x6.5
M66xU/O	2x4.5	2x4.8	2x19.0	2x2.09	2x15.1	2x22.0	2x127.0	2x7.98	1.02	2x15.1	2x22.0	2x127.0	2x7.5
L83xU	2x5.8	2x6.0	2x17.8	2x3.08	2x17.6	2x26.0	2x159.0	2x9.98	0.83	2x14.9	2x26.0	2x159.0	2x9.3
L99xU	2x5.8	2x6.0	2x17.8	2x3.29	2x20.8	2x30.0	2x198.0	2x12.12	0.72	2x20.3	2x30.0	2x198.0	2x11.6

(*) At standard operating conditions ESP: 50 Pa for Over units and 20 Pa for Under units
Filters: class G4

(**) At nominal operating conditions: Condensing temperature 45°C — Room conditions 24°C / 50% RH

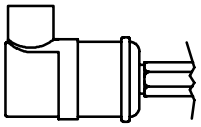
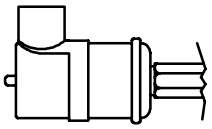
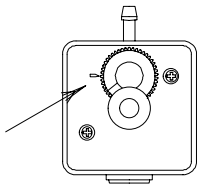
Tab. 4 — Electrical data (optional component)

Component	ELECTRICAL HEATING		HUMIDIFIER	
Model	FLA [A]	Nominal power [kW]	FLA [A]	Nominal power [kW]
(230V / 1Ph / 50Hz)				
S04—05U/O	6.5	1.5	6.5	1.5
(400V / 3Ph / 50Hz)				
S07—10—12U/O	6.5	4.50	4.6	3.0
S13—17—20—23 U/O	8.6	5.85	9.0	5.8
M25—29U/O	11.0	7.5	9.0	5.8
M31÷66U/O	22.0	15.0	13.0	9.0
L83U	26.0	18.0/3	13.0	9.0
L99U	26.0	18.0/3	13.0	9.0

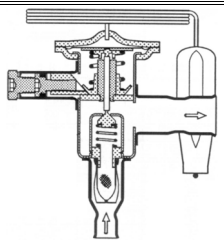
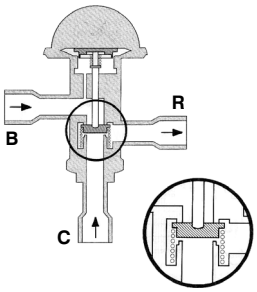
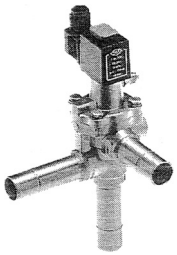
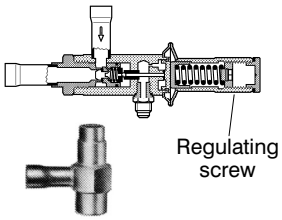
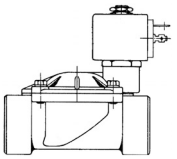
Component	EC OPTIONAL FAN (400V / 3Ph / 50Hz)			
Model	OA* [A]	FLA [A]	LRA [A]	Nominal power* (kW)
S13UA	1.00	4.0	0.1	0.62
S17UA	1.17	4.0	0.1	0.72
S20UA	1.55	4.0	0.1	0.96
S23UA	2.39	4.0	0.1	1.48
M25UA	1.77	4.0	0.1	1.08
M29UA	2.32	4.0	0.1	1.44
M31UA	2 x 0.73	2 x 4.0	2 x 0.1	2 x 0.45
M34UA	2 x 1.04	2 x 4.0	2 x 0.1	2 x 0.65
M35UA	2 x 1.04	2 x 4.0	2 x 0.1	2 x 0.65
M41UA	2 x 1.58	2 x 4.0	2 x 0.1	2 x 0.98
M42UA	2 x 1.59	2 x 4.0	2 x 0.1	2 x 0.99
M47UA	2 x 2.25	2 x 4.0	2 x 0.1	2 x 1.40
M50UA	2 x 2.25	2 x 4.0	2 x 0.1	2 x 1.40
M58UA	2 x 2.47	2 x 4.0	2 x 0.1	2 x 1.52
M66UA	2 x 3.13	2 x 4.0	2 x 0.1	2 x 1.94
L83UA	2 x 3.00	2 x 5.0	2 x 0.1	2 x 1.92
L99UA	2 x 3.54	2 x 5.0	2 x 0.1	2 x 2.30

(*) At standard operating conditions ESP: 20 Pa for Under units MxxUA — Filters: class G4

Tab. 5 — Calibrations of electrical components

Refrigeration Circuit Item no.	COMPONENT	SETTING	NOTES	Contact
16	**Low Pressure Switch (LP)**	STOP 1 barg START 2 barg DIFFER. (fixed) 1.0 bar (fixed setting — automatic re-set)	 Delayed automatic reset (see iCom manual)	Nolmally closed
3	**High Pressure Switch (HP)**	STOP 26 barg START 20 barg DIFFER. (fixed) 6.0 bar (fixed setting — manual re-set)	 Reset	Nolmally closed
—	**Clogged filter differential pressure switch (CF)**	Filter G4 = 2 mbar Filter G5 = 3 mbar	 Setting ring	Nolmally closed

Tab. 6 – Adjustments and calibrations of valves (see Enclosed E – Refrigeration circuits)

Refrigerant Circuit Pos.	Component	Calibration & Operating	Application	Model	Drawing
10	**Thermostatic valve**	Overheating control 5 ÷ 8 K (see para. 9.1)	All versions	Danfoss mod. TUBE mod. TCBE mod. TDEZ	
18	**Head pressure control valve**	Factory calibrated 13 ÷ 14 bar	Liebert HPM W/ F/H	ALCO HP5 T4–225 HP8 T5–225	
11	**Hot gas injection 3 way valve** Reheating mode	ON–OFF action, controlled by iCom (re–heating)	Liebert HPM A/W/F/D/H (no Liebert HPM Constant)	ALCO 3031RC12S7	
11	**Hot gas injection 3 way valve** Room thermal load control	Modulating action, controlled by iCom 0 ÷ 10 VDC (see para. 9.3)	Liebert HPM K only (Constant)	Siemens M3FB15LX	
21 + 22	**Hot gas injection** Antifreeze protecion in Freecooling unit	Modulating action **N.B. Calibrated at +2°C at machine start up**	Liebert HPM F/ D/H	Danfoss CPCE + LG	
	Hot gas injection Evaporating pressure control		Liebert HPM KA/KW		
19	**2–way chilled water valve**	Modulating action (servomotor: see para. 9.4)	Liebert HPM F	Siemens VXP 459	
	3–way chilled water valve	Modulating action (servomotor: see para. 9.4)	Liebert HPM D–H	Siemens VXP 459	
25	**Solenoid valve**	ON–OFF action (coupled to valve 19)	Liebert HPM F	Parker PM 133 CN	

Tab. 7 – R407C/R22 refrigerant and oil charge for air cooled models (A–D type)

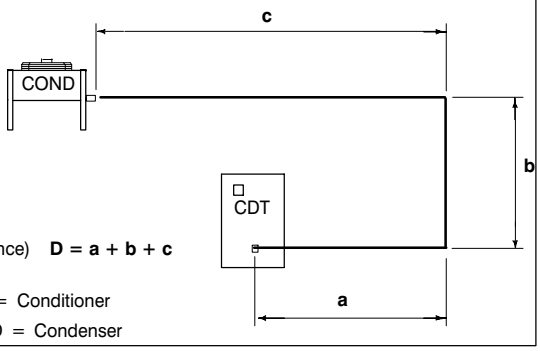
MODEL	BASE REFRIGERANT CHARGE (2) [kg – each circuit]		BASE OIL CHARGE (1) (liters) oil within compressor	
	without hot gas reheating	with hot gas reheating	initial oil charge	Max topping up
S04xA	2.2	2.5	0.74	0.62
S05xA	2.2	2.5	1.12	1.01
S07xA	2.2	2.5	1.24	1.12
S10xA	2.2	2.5	1.24	1.12
S12xA	2.2	2.5	1.36	1.24
S13xA	2.9	5.7	1.36	1.24
S17xA	2.9	5.7	1.95	1.83
S17xD	2.9	4.2	1.95	1.83
S20xA	3.2	6.0	1.77	1.66
S20xD	3.2	4.5	1.77	1.66
S23xA	3.5	6.3	2.51	2.40
S23xD	3.2	4.5	2.51	2.40
M25xA–D	5.0	6.4	2.51	2.40
M29xA	5.5	6.9	4.14	4.05
M31xA–D	5.8	8.6	4.14	4.05
M35xA–D	6.2	9.0	4.14	4.05
M41xA–D	6.7	9.5	4.14	4.05
M47xA–D	7.1	9.9	4.14	4.05
M34xA–D	3.7	6.5	1.95	1.83
M42xA–D	4.4	7.2	1.77	1.66
M50xA–D	5.0	7.8	2.51	2.40
M58xA–D	5.5	8.3	4.14	4.05
M66xA	6.0	8.8	4.14	4.05
L83xA–D	5.8	5.8 / 8.3	4.14	4.05
L99xA	6.5	6.5 / 9.0	4.14	4.05

Tab. 7a – Refrigerant and oil pipe charge

Pipe diameter [mm]	Refrigerant pipe charge [kg/m] for distances D (3)		Oil pipe charge [l]	
Liquid	without hot gas reheating	with hot gas reheating	charge to be added for every 10 m over 30 m between CDT and COND without hot gas reheating	charge to be added for every 10 m over 30 m between CDT and COND with hot gas reheating (4)
10	0.070	0.140	0.05	0.10
12	0.101	0.202	0.08	0.16
14	0.137	0.274	0.12	0.24
16	0.178	0.356	0.15	0.30
18	0.227	0.454	0.19	0.38
22	0.339	0.678	0.25	0.50

(1) The recommended oil for units with R407C refrigerant is EMKARATE RL 32–3MA. For units with R22 refrigerant **pay attention to compressor label**: if requested mineral oil this will be SUNISO 3 GS, if requested ester oil this will be EMKARATE RL 32–3MA.
(2) Unit coupled with remote condenser suggested for ambient temperature up to 35°C. The final charge must be precisely defined in field.
(3) For distance D see Fig. 1.
(4) Topping up is requested for short pipeline too, due to the extra–charge of refrigerant.
N.B.: The air conditioner is supplied pressurized with helium at 1 bar.

Fig. 1 – Pipeline air conditioner – condenser



Tab. 8 – Refrigerant and oil charge for water cooled models (W–F–H type)

MODEL	R407C/R22 REFRIGERANT CHARGE [kg – each circuit]		OIL CHARGE (1) (liters)
	without hot gas reheating	with hot gas reheating	
S04xW	2.5	2.8	0.74
S05xW	2.5	2.8	1.12
S07xW	2.7	3.0	1.24
S10xW	2.7	3.0	1.24
S12xW	2.7	3.0	1.36
S13xW	3.8	5.1	1.36
S17xW	3.8	5.1	1.95
S17xF–H	3.8	5.1	1.95
S20xW	4.1	5.4	1.77
S20xF–H	4.1	5.4	1.77
S23xW	4.4	5.7	2.51
S23xF–H	4.1	5.4	2.51
M25xW–F–H	6.3	7.8	2.51
M29xW	7.4	8.8	4.14
M31xW–F–H	7.7	10.5	4.14
M35xW–F–H	8.4	11.2	4.14
M41xW–F–H	9.6	12.4	4.14
M47xW–F–H	10.4	13.2	4.14
M34xW–F–H	4.7	7.5	1.95
M42xW–F–H	5.4	8.2	1.77
M50xW–F–H	6.3	9.1	2.51
M58xW–F–H	7.4	10.2	4.14
M66xW	8.2	11.0	4.14
L83xW–F–H	8.8	8.8 / 13.2	4.14
L99xW	10.0	10.0 / 15.0	4.14

N.B.: The air conditioner is supplied complete with refrigerant and oil.

(1) The recommended oil for units with R407C refrigerant is EMKARATE RL 32–3MA. For units with R22 refrigerant **pay attention to compressor label**: if requested mineral oil this will be SUNISO 3 GS, if requested ester oil this will be EMKARATE RL 32–3MA.

Fig. 1. Overall dimensions Service Area S models

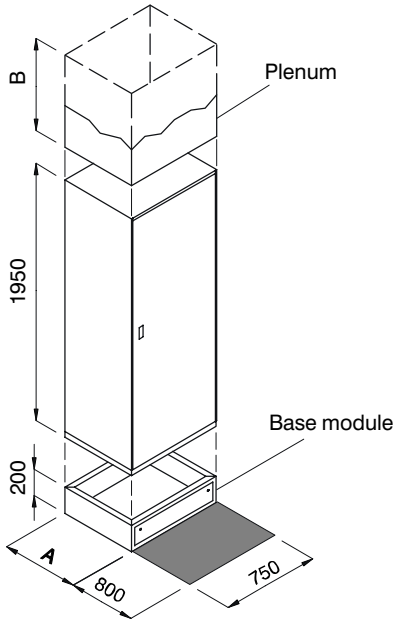


Fig. 2. Overall dimensions Service Area M25–29

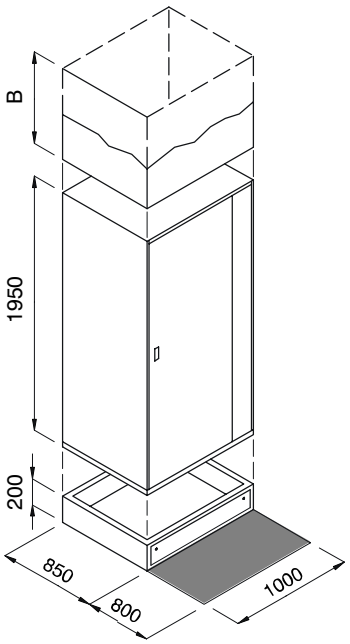


Fig. 3. Overall dimensions Service Area M31...66

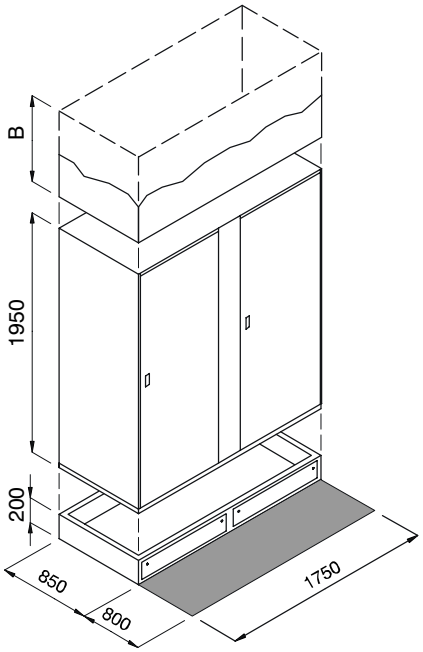
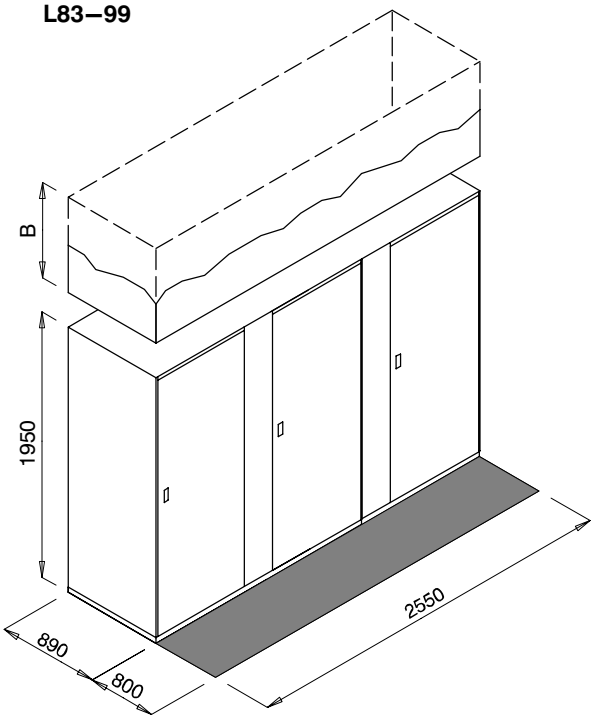


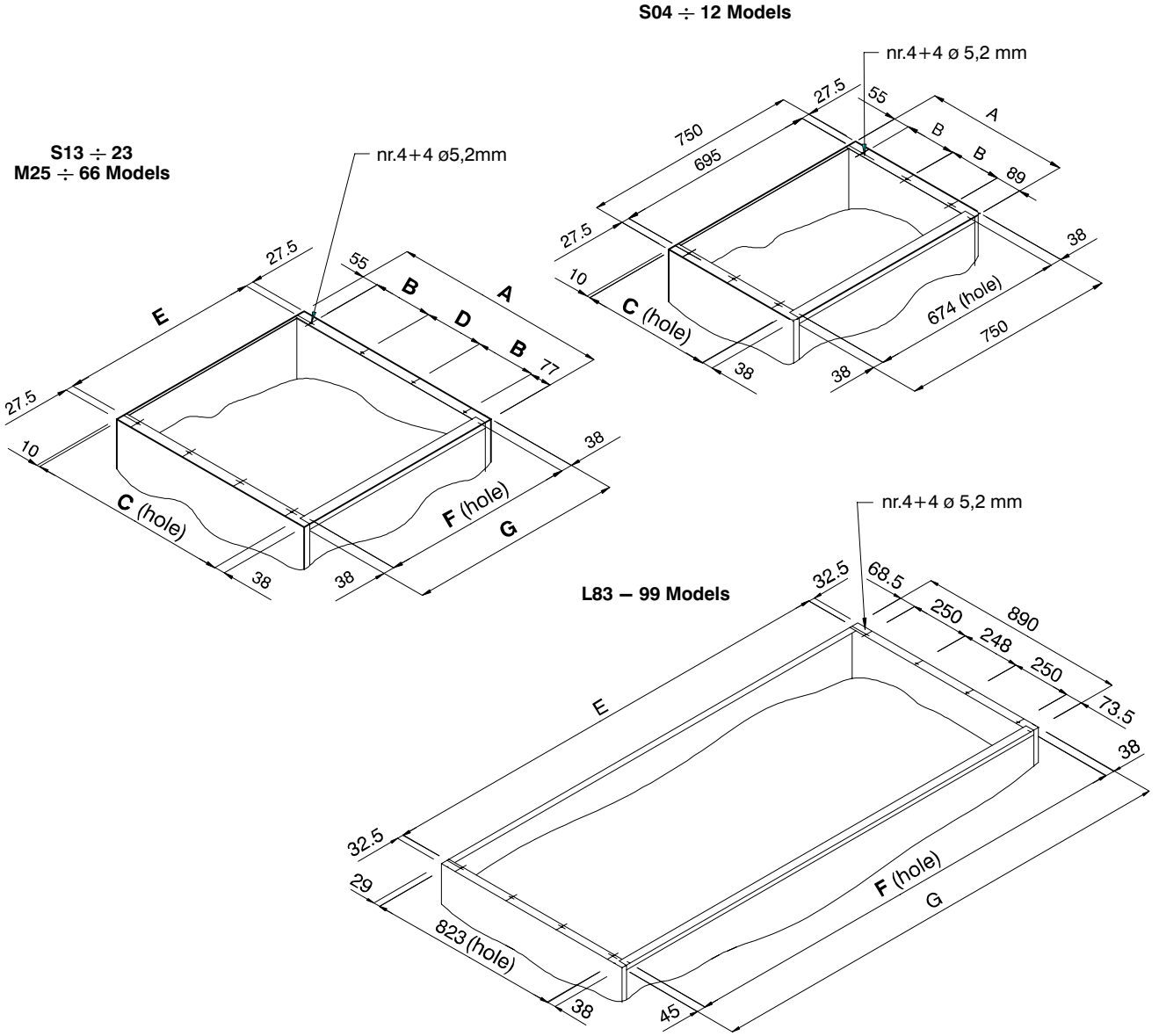
Fig. 4. Overall dimensions Service Area L83–99



Models	A (mm)	AVAILABLE PLENUM HEIGHTS: B (mm)			
		Simple plenum	Plenum for silencing cartridges	Plenum for high efficiency filters	Plenum with frontal airflow (OVER only)
S04–05	400	500–600–700– 800 – 900–1000–100–1200	600–900–1200	500–600–700– 800–900	600
S07–10–12	500				
S13–17–20–23	750				
M25–29	850				
M31–34–35–41 42–47–50–58–66	850				
L83–99	890	600–700– 800 – 900–1000–100–1200		600–700–800–900	–

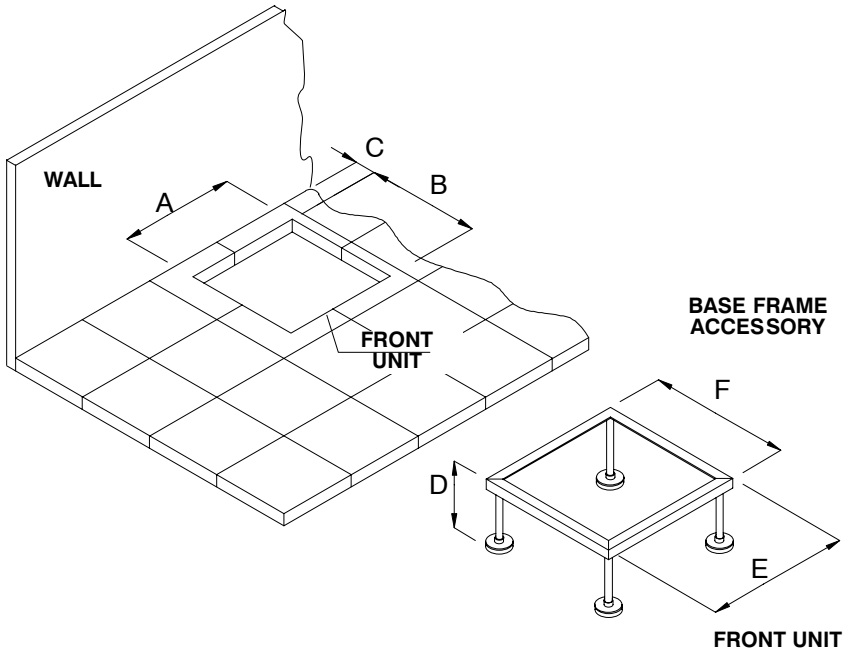
MODELS	WEIGHTS (kg)						
	Versions						
	A	W	F	D	H	K / A	K / W
S04	160	165					
S05	170	175					
S07	195	200				200	205
S10	210	215				215	220
S12	215	222				222	229
S13	240	247				247	254
S17	250	260	290	280	290	260	270
S20	260	270	310	300	310	270	280
S23	270	280	320	310	320	280	290
M25	415	425	510	500	510	425	435
M29	420	430					
M31	565	575	715	705	715		
M34	580	590	725	715	725		
M35	570	580	720	710	720		
M41	585	600	730	715	730		
M42	585	600	745	730	745		
M47	605	620	740	725	740		
M50	620	635	755	740	755		
M58	625	650	770	745	770		
M66	645	670					
L83	925	950	1140	1115	1140		
L99	975	1000					

Fig. 5. Air inlet and outlet – hole for plenum connection



Models	**A** mm	**B** mm	**C** mm	**D** mm	**E** mm	**F** mm	**G** mm
S04 – 05	400	128	352				
S07 – 10 – 12	500	178	452				
S13 – 17 – 20 – 23	750	206	702	206	695	674	750
M25–29	850	240	802	238	945	924	1000
M31 ÷ 66	850	240	802	238	1695	1674	1750
L83 –99					2485	2460	2550

Fig. 6. Hole in raised floor



MODELS	Dimensions (mm) A without base frame	A with base frame	B without base frame	B with base frame	C without base frame	C with base frame	D	E	F
S04–05	690	750	320	390	50	10	≤ 300	740	380
S07–10–12			420	490					480
S13–17–20–23			670	740					730
M25–29	930	1000	770	840			≤ 500	990	830
M31...66	1680	1750					≤ 800	1740	
L83–99	2460	2550	805	895				2550	885

CAUTION: For "UNDER" units installed on raised floor, inhibit inappropriate access to the unit from the base to not–authotized staff: i.e. fixing the floor panels up to 850 mm from the unit.

Fig. 7. Extension hood

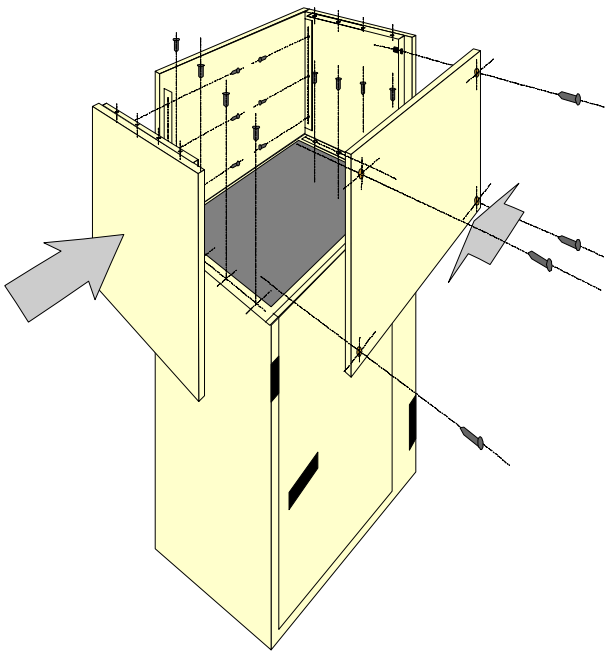
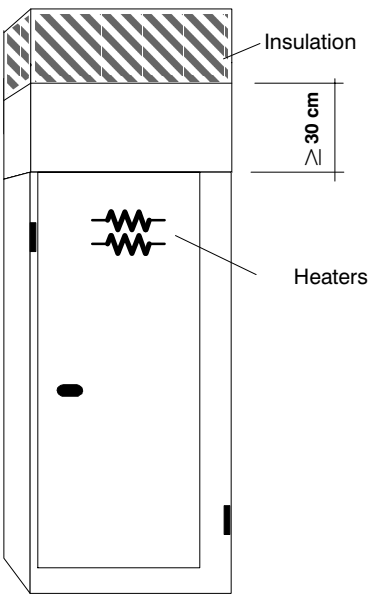


Fig. 8. Over conditioner with electrical heaters. Upflow ducted conditioner equipped with electrical heaters, connected to air duct not supplied by Emerson Network Power**. Pay attention to the position of insulating material!**



Note: See Chap. 2

Fig. 9. Base module

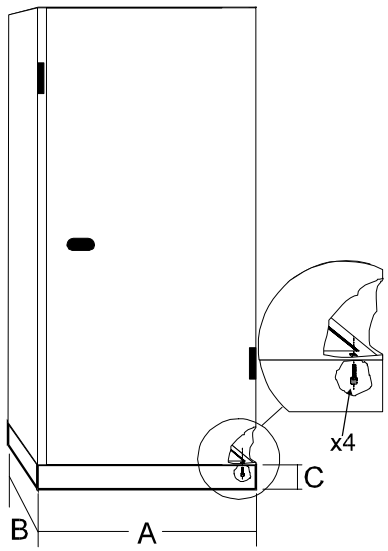


Fig. 10. Base frame

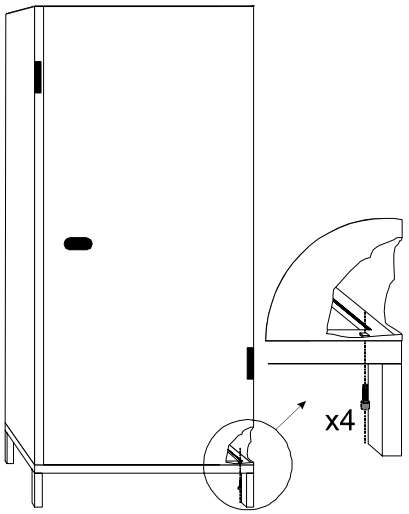


Fig. 11. High efficiency filters

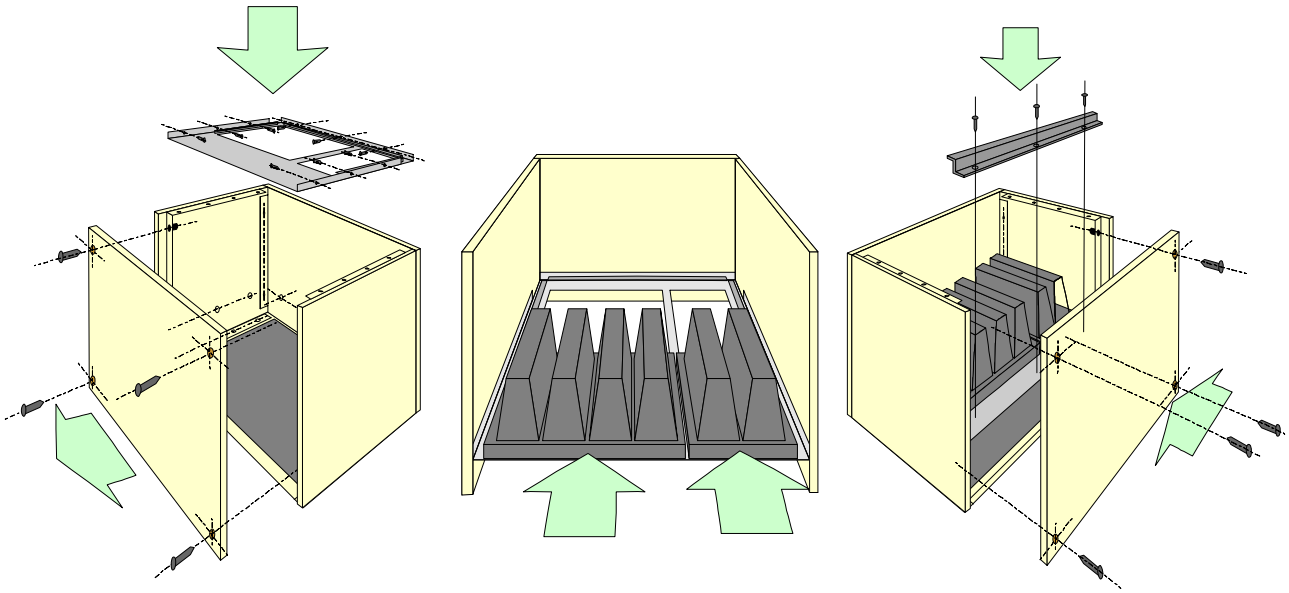
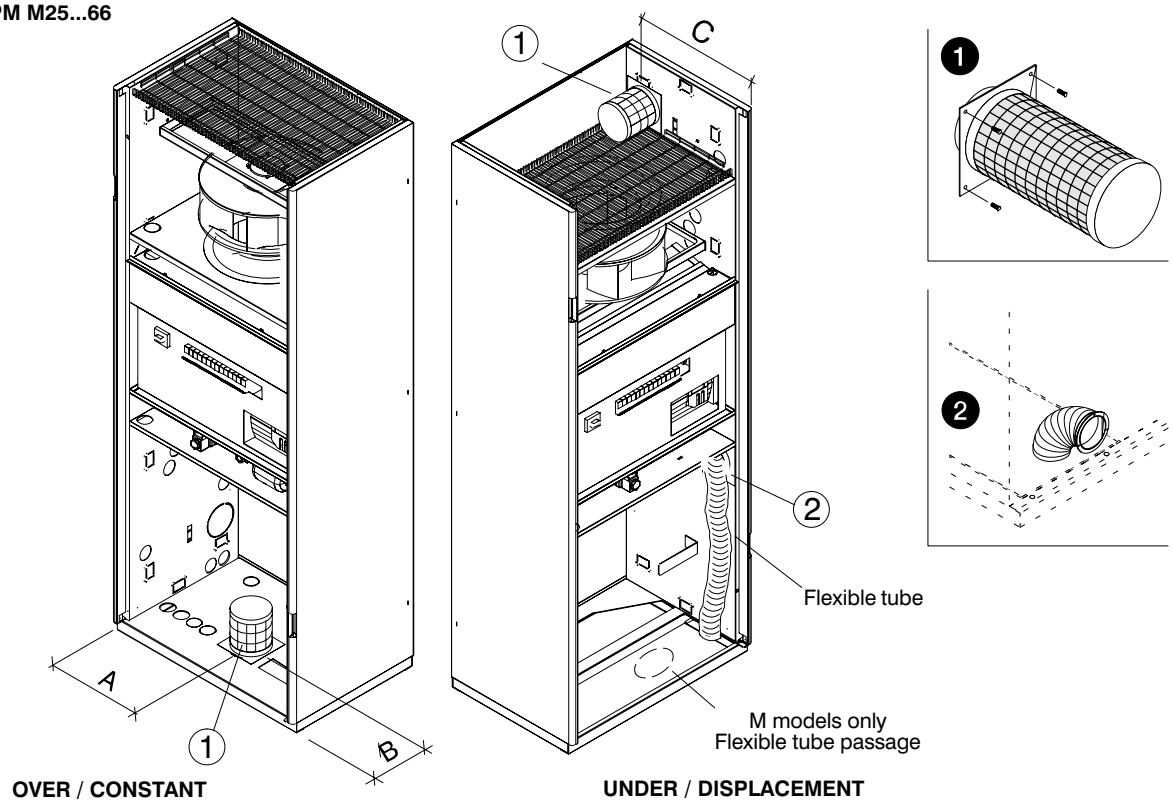
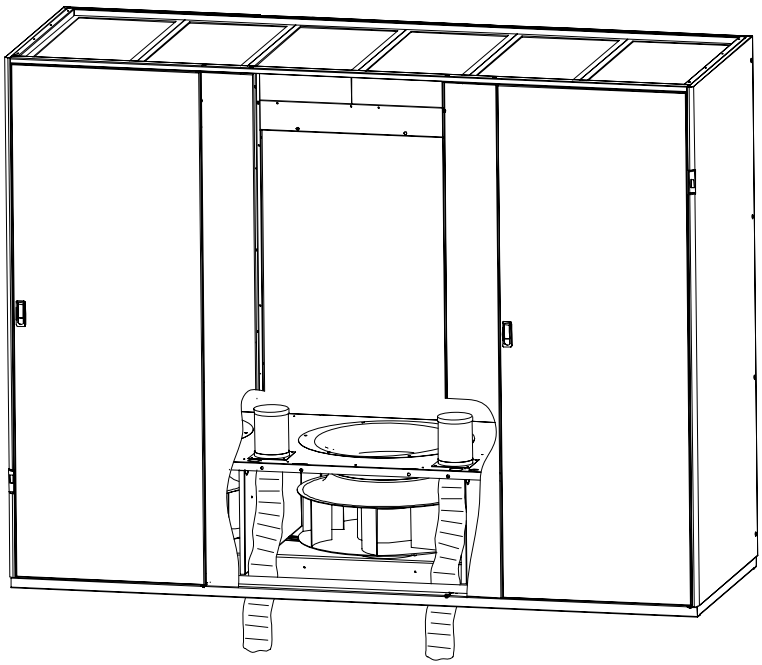


Fig. 12. New air module

Liebert HPM S04...23
Liebert HPM M25...66



Liebert HPM L83–99



MODELS	Dimensions (mm)		
	A	B	C
S04–05	185	310	320
S07–10–12	375	190	420
S13–17–20–23	155	450	660
M25–29	650	565	145
M31...66	225	565	145

Fig. 13. Bleed valve position

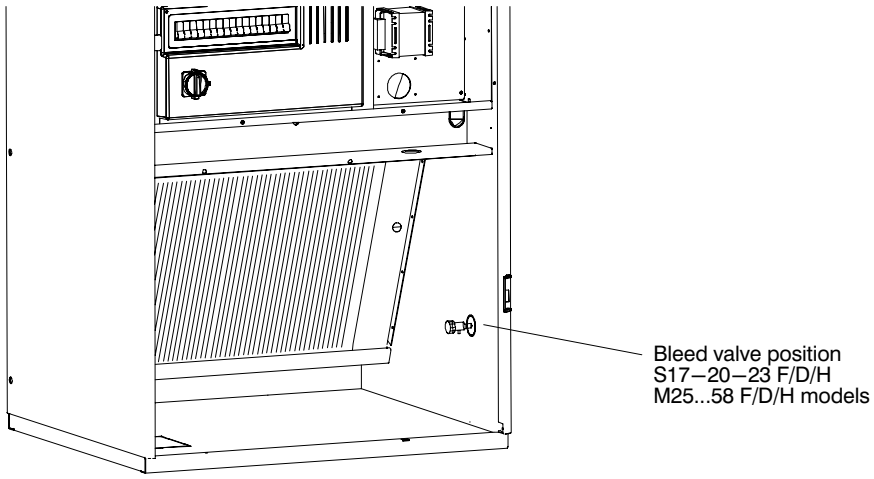
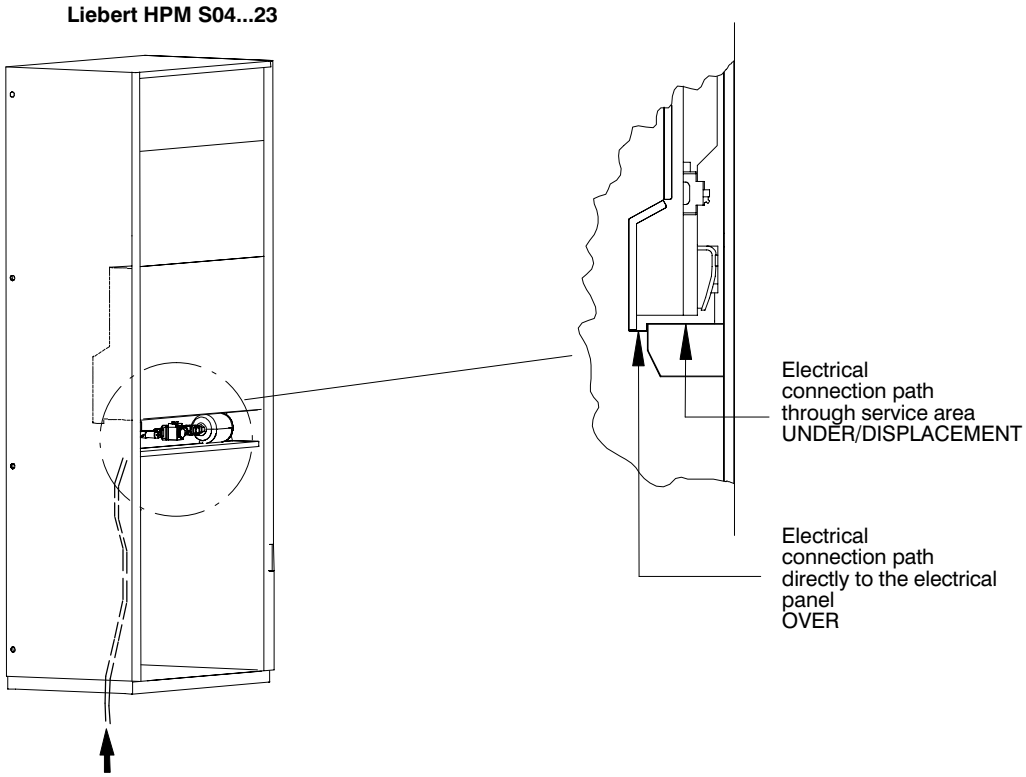
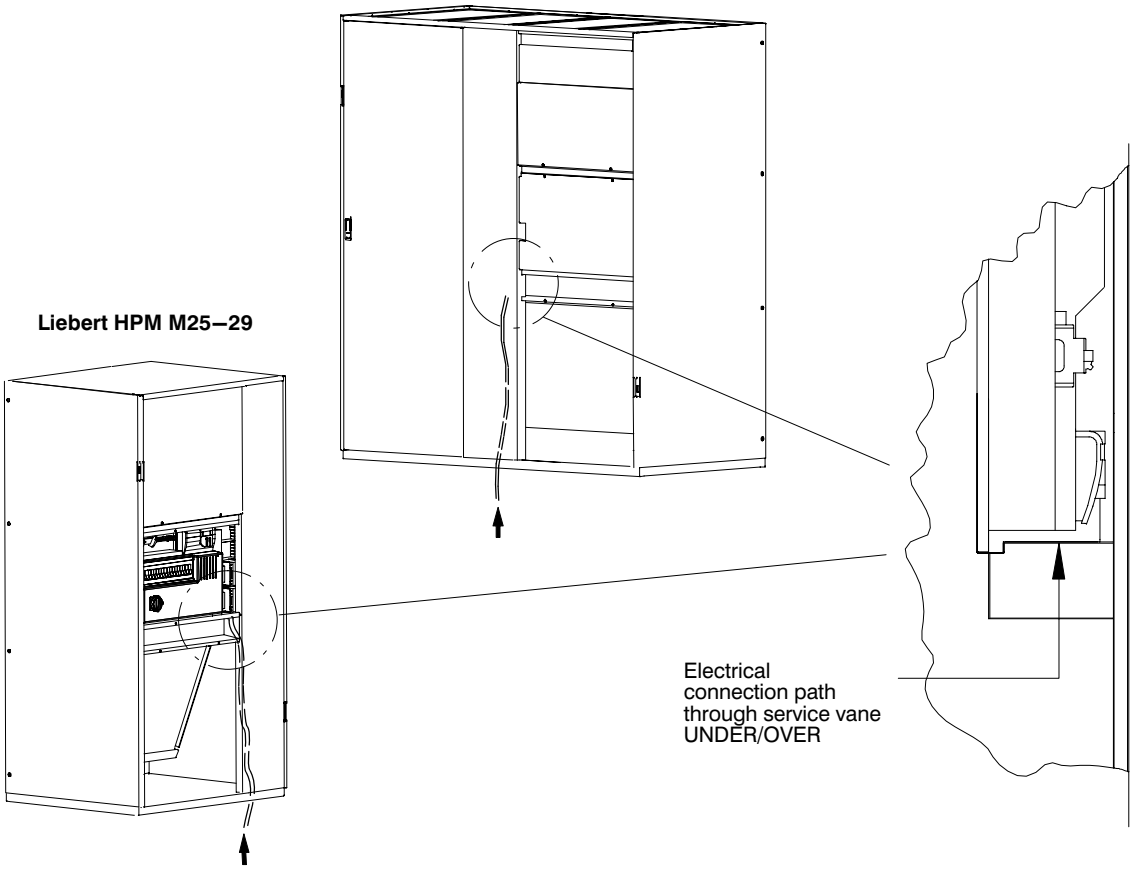


Fig. 14. Supply cable path



Liebert HPM M31...66

Liebert HPM M25—29



Liebert HPM L83—99

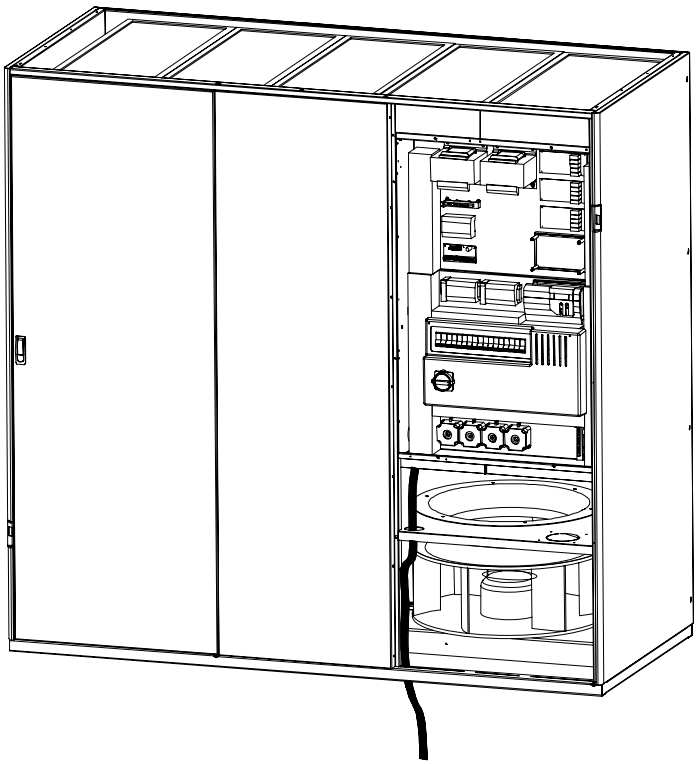
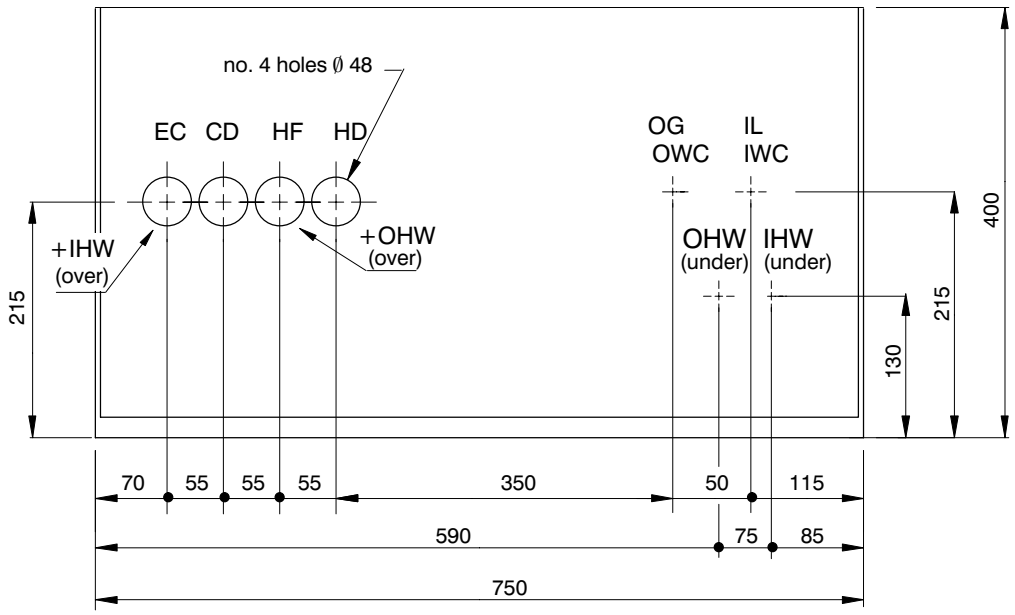


Fig. 1. Refrigerant, water and electrical connections Liebert HPM S04 ÷ 05 - Plan view

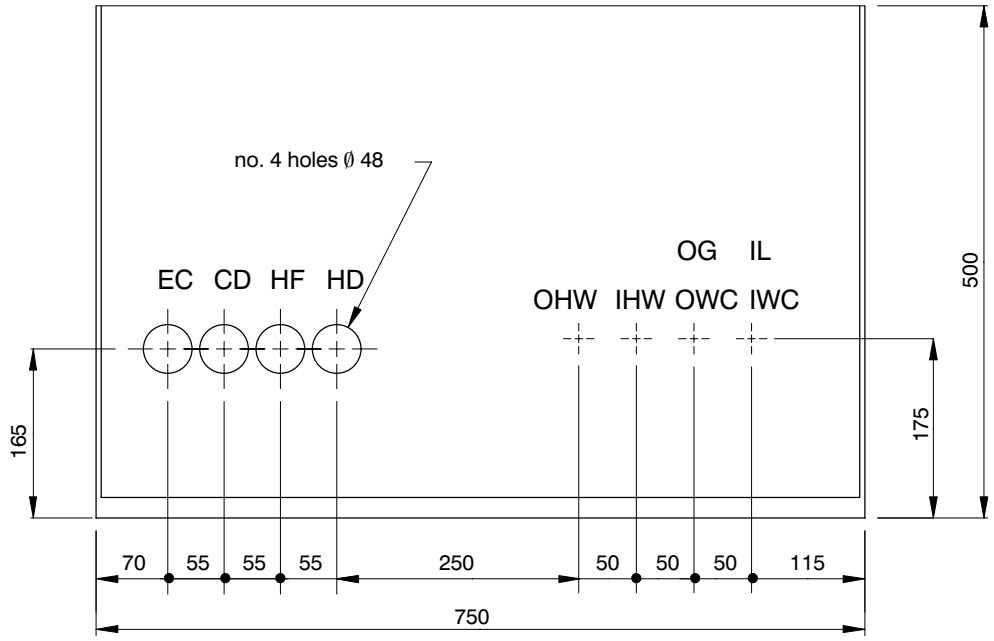


UNIT FRONT

Unit Connection		Version	
		A	W
IL	Refrigerant liquid line inlet *	OD 12 mm	
OG	Refrigerant gas line outlet *	OD 12 mm	
IWC	Water to condenser inlet		1/2" GAS-F
OWC	Water from condenser outlet		1/2" GAS-F
IHW	Hot water inlet (opt.)	OD 16 mm	
OHW	Hot water outlet (opt.)	OD 16 mm	
CD	Condensate drain	ID 20 mm	
HF	Humidifier feed (opt.)	1/2" GAS-M	
HD	Humidifier drain (opt.)	ID 22 mm	
EC	Electrical power supply	Hole Ø 48 mm	

* ***Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

Fig. 2. Refrigerant, water and electrical connections Liebert HPM S07 ÷ 12 - Plan view

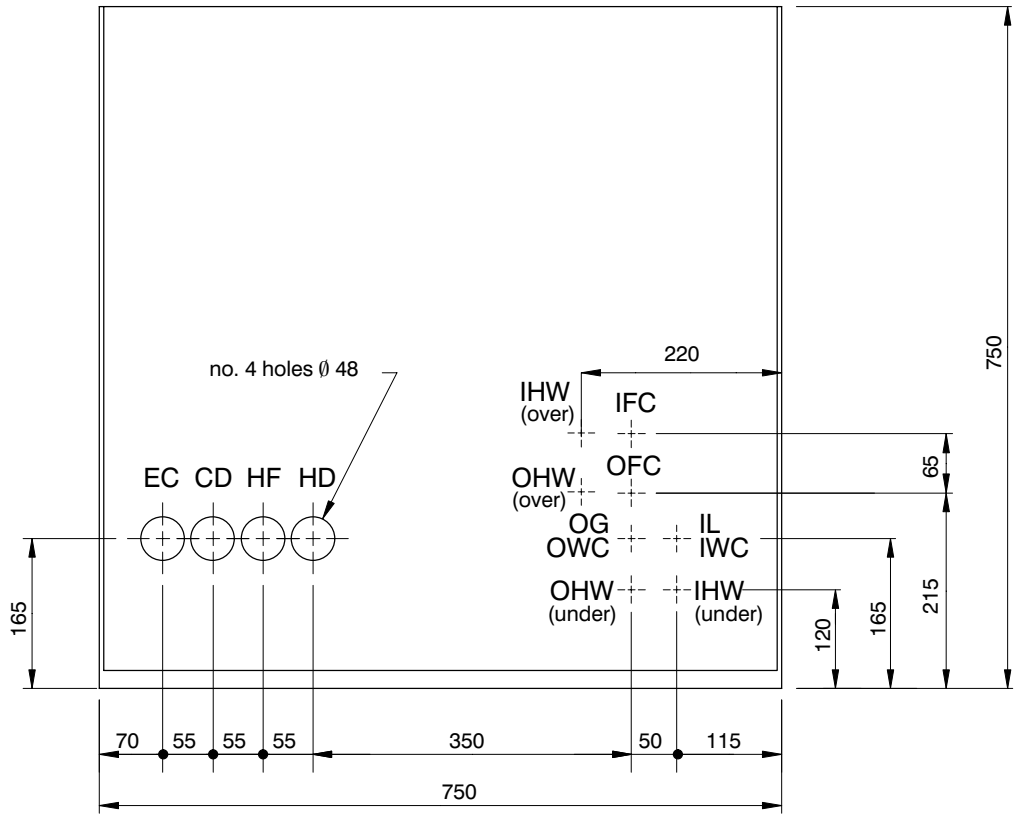


UNIT FRONT

Unit Connection		Version	
		A	W
IL	Refrigerant liquid line inlet *	OD 12 mm	
OG	Refrigerant gas line outlet *	OD 16 mm	
IWC	Water to condenser inlet		3/4" GAS-F
OWC	Water from condenser outlet		3/4" GAS-F
IHW	Hot water inlet (opt.)	OD 16 mm	
OHW	Hot water outlet (opt.)	OD 16 mm	
CD	Condensate drain	ID 20 mm	
HF	Humidifier feed (opt.)	1/2" GAS-M	
HD	Humidifier drain (opt.)	ID 22 mm	
EC	Electrical power supply	Hole Ø 48 mm	

* ***Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

Fig. 3. Refrigerant, water and electrical connections Liebert HPM S13 ÷ 23

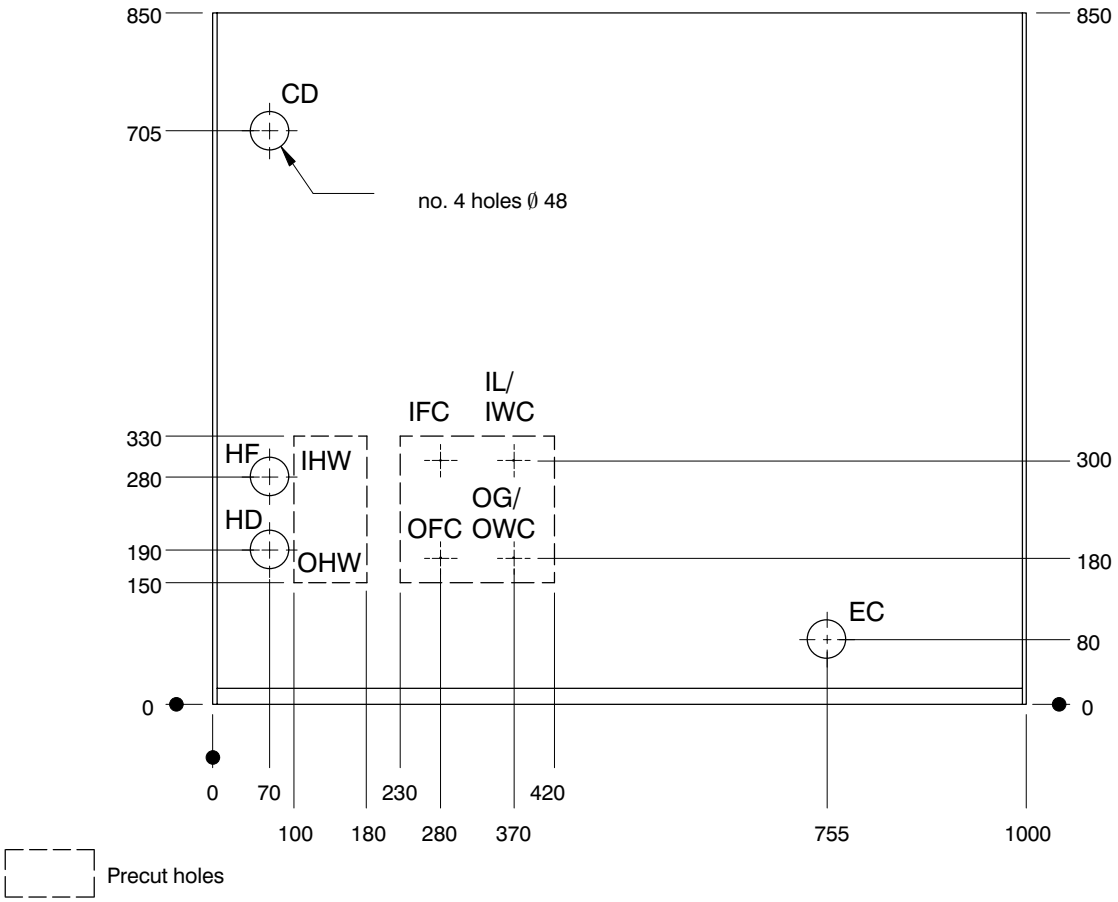


UNIT FRONT

Unit Connection		Version				
		A	W	D	H	F
IL	Refrigerant liquid line inlet *	OD 16 mm		OD 16 mm		
OG	Refrigerant gas line outlet *	OD 18 mm		OD 18 mm		
IWC	Water to condenser inlet		3/4" GAS-F		3/4" GAS-F	
OWC	Water from condenser outlet		3/4" GAS-F		3/4" GAS-F	
IHW	Hot water inlet (opt.)	OD 18 mm				
OHW	Hot water outlet (opt.)	OD 18 mm				
IFC	Water inlet to Freecooling/Dualfluid coil			1" GAS-F	1" GAS-F	1" GAS-F
OFC	Water outlet from Freecooling/Dualfluid coil			1" GAS-F	1" GAS-F	1" GAS-F
CD	Condensate drain	ID 20 mm				
HF	Humidifier feed (opt.)	1/2" GAS-M				
HD	Humidifier drain (opt.)	ID 22 mm				
EC	Electrical power supply	Hole ∅ 48 mm				

* ***Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

Fig. 4. Refrigerant, water and electrical connections Liebert HPM M25-29

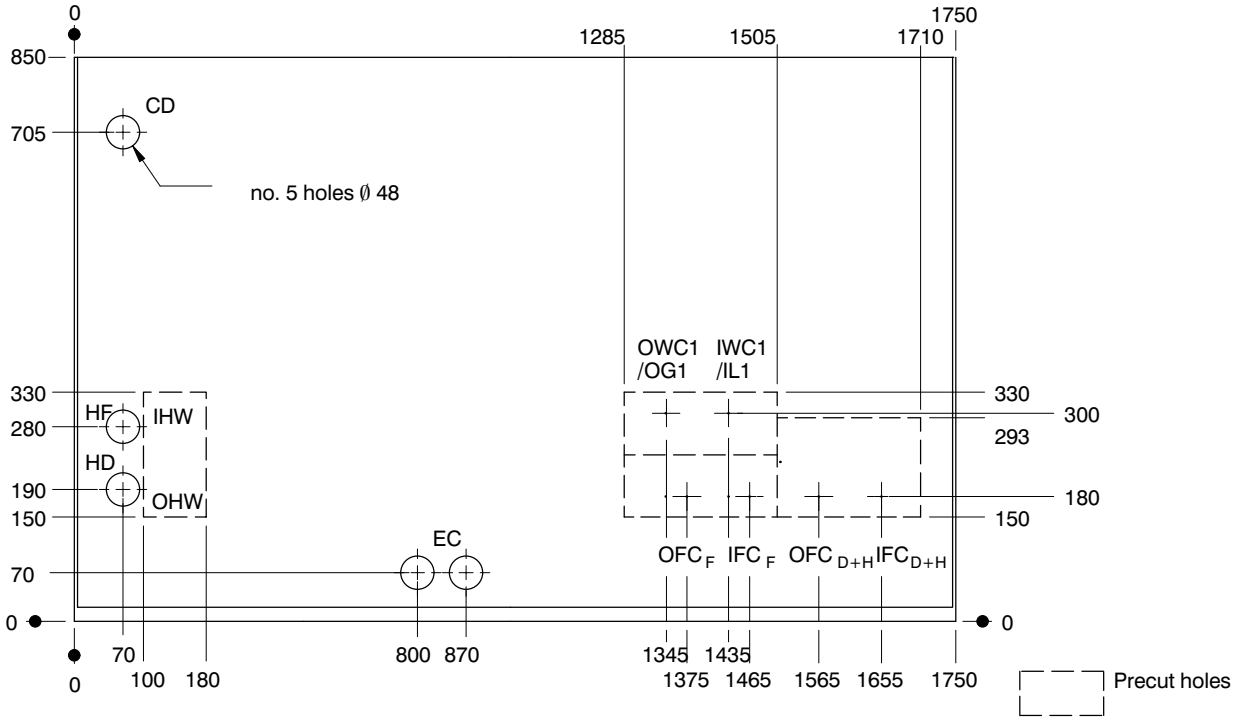


UNIT FRONT

Unit Connection		Version				
		A	W	D	H	F
IL	Refrigerant liquid line inlet *	OD 16 mm		OD 16 mm		
OG	Refrigerant gas line outlet *	OD 18 mm		OD 18 mm		
IWC	Water to condenser inlet		1" GAS-F		1" GAS-F	
OWC	Water from condenser outlet		1" GAS-F		1" GAS-F	
IHW	Hot water inlet (opt.)	OD 18 mm				
OHW	Hot water outlet (opt.)	OD 18 mm				
IFC	Water inlet to Freecooling and Dualfluid coil			1" GAS-F	1" GAS-F	1.1/4" GAS-F
OFC	Water outlet from Freecoolingn and Dualfluid coil			1" GAS-F	1" GAS-F	1.1/4" GAS-F
CD	Condensate drain	ID 20 mm				
HF	Humidifier feed (opt.)	1/2" GAS-M				
HD	Humidifier drain (opt.)	ID 22 mm				
EC	Electrical power supply	Hole Ø 48 mm				

* ***Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

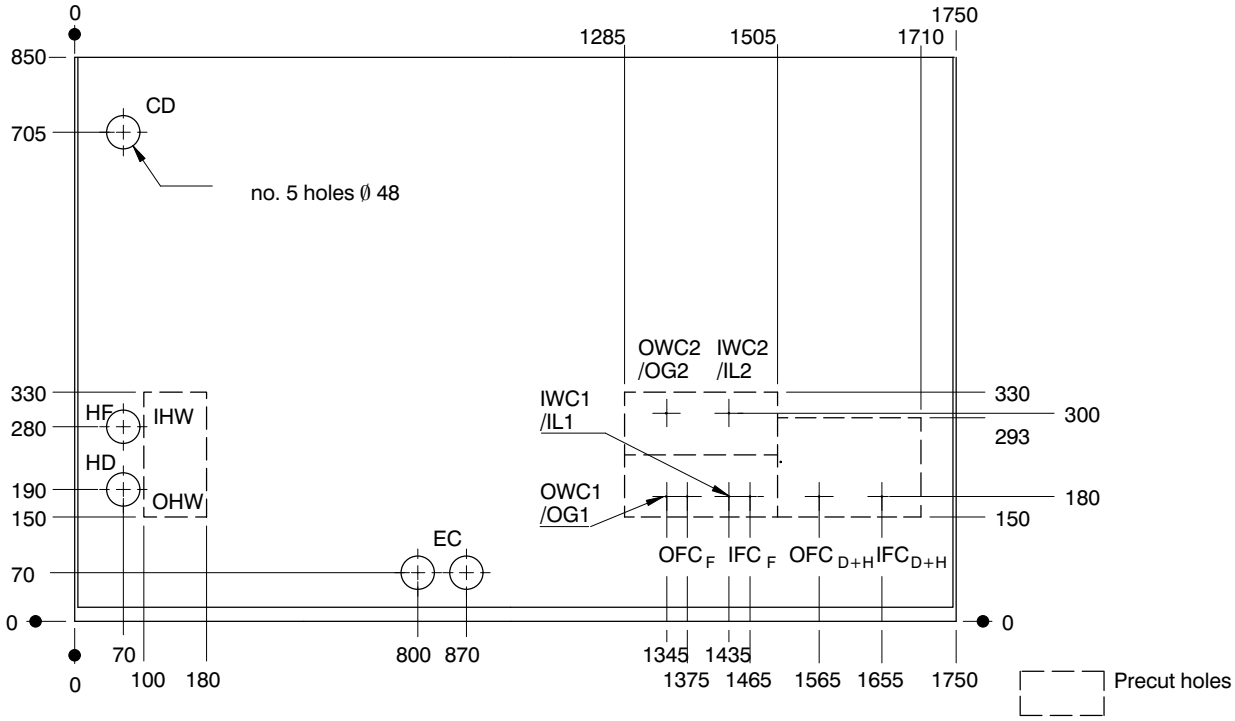
Fig. 5. Refrigerant, water and electrical connections Liebert HPM M31...47singlecircuit - Plan view



Models	Unit Connection		Version				
			A	W	D	H	F
M31- 35	IL1	Refrigerant liquid line inlet 1*	OD 16 mm		OD 16 mm		
M41- 47			OD 18 mm		OD 18 mm		
M31- 35	OG1	Refrigerant gas line outtlet 1*	OD 18 mm		OD 18 mm		
M41- 47			OD 22 mm		OD 22 mm		
M31- 35- 41- 47	IWC1	Water to condenser 1 inlet		1.1/4" GAS-F		1.1/4" GAS-F	
M31- 35- 41- 47	OWC1	Water from condenser 1 outlet		1.1/4" GAS-F		1.1/4" GAS-F	
Mxx	IHW	Hot water inlet (opt.)	OD 22 mm				
Mxx	OHW	Hot water outlet (opt.)	OD 22 mm				
M31- 35	IFC (F)	Water inlet to Freecooling					1.1/4" GAS-F
M41- 47	IFC (F)						1.1/2" GAS-F
M31- 35	OFC (F)	Water outlet from Freecooling					1.1/4" GAS-F
M41- 47	OFC (F)						1.1/2" GAS-F
M31- 35	IFC (D+H)	Water inlet to Dualfluid			1.1/4" GAS-F	1.1/4" GAS-F	
M41- 47	IFC (D+H)				1.1/2" GAS-F	1.1/2" GAS-F	
M31- 35	OFC (D+H)	Water outlet from Dualfluid			1.1/4" GAS-F	1.1/4" GAS-F	
M41- 47	OFC (D+H)				1.1/2" GAS-F	1.1/2" GAS-F	
Mxx	CD	Condensate drain	ID 20 mm				
Mxx	HF	Humidifier feed (opt.)	1/2" GAS-M				
Mxx	HD	Humidifier drain (opt.)	ID 22 mm				
Mxx	EC	Electrical power supply	Hole ∅ 48 mm				

** Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.*

Fig. 6. Refrigerant, water and electrical connections Liebert HPM M34...66, doublecircuit - Plan view

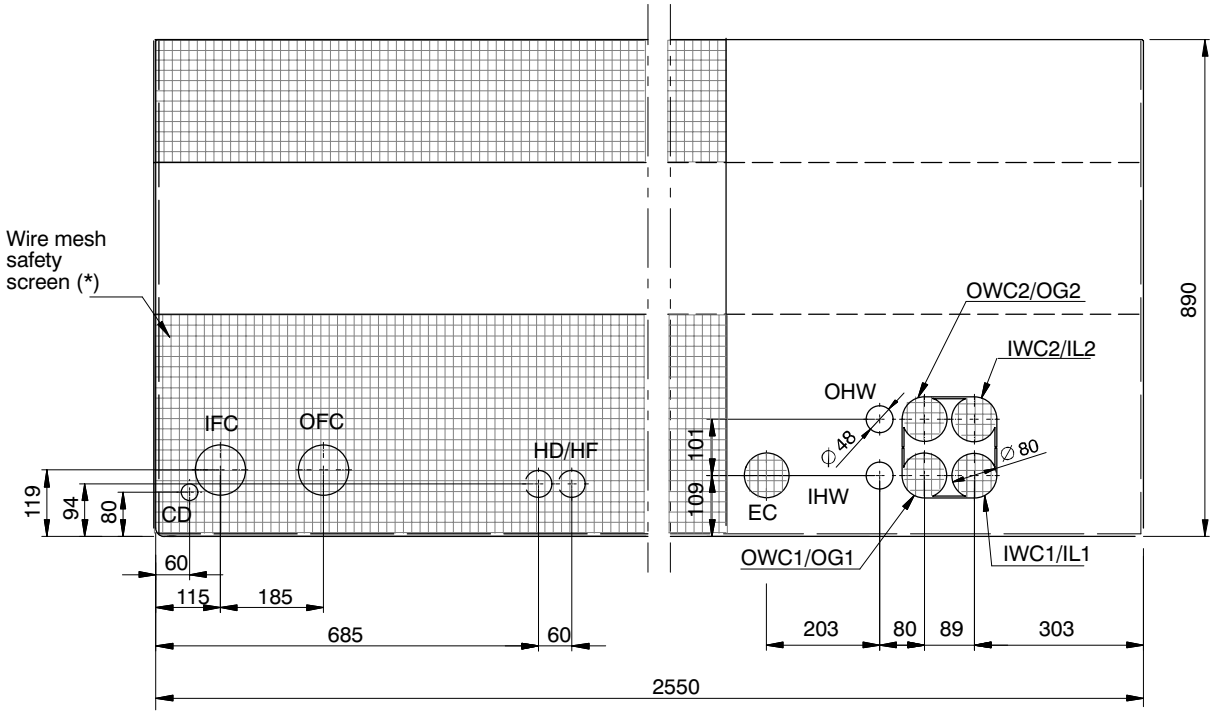


UNIT FRONT

Models	Unit Connection		Version				
			A	W	D	H	F
M34- 42- 50- 58- 66	IL1	Refrigerant liquid line inlet 1*	OD 16 mm		OD 16 mm		
M34- 42- 50- 58- 66	IL2	Refrigerant liquid line inlet 2*	OD 16 mm		OD 16 mm		
M34- 42- 50- 58- 66	OG1	Refrigerant gas line outtlet 1*	OD 18 mm		OD 18 mm		
M34- 42- 50- 58- 66	OG2	Refrigerant gas line outlet 2 *	OD 18 mm		OD 18 mm		
M34- 42	IWC1	Water to condenser 1 inlet		3/4" GAS-F		3/4" GAS-F	
M50- 58- 66				1.1/4" GAS-F		1.1/4" GAS-F	
M34- 42	IWC2	Water to condenser 2 inlet		3/4" GAS-F		3/4" GAS-F	
M50- 58- 66				1.1/4" GAS-F		1.1/4" GAS-F	
M34- 42	OWC1	Water from condenser 1 outlet		3/4" GAS-F		3/4" GAS-F	
M50- 58- 66				1.1/4" GAS-F		1.1/4" GAS-F	
M34- 42	OWC2	Water from condenser 2 outlet		3/4" GAS-F		3/4" GAS-F	
M50- 58- 66				1.1/4" GAS-F		1.1/4" GAS-F	
Mxx	IHW	Hot water inlet (opt.)	OD 22 mm				
Mxx	OHW	Hot water outlet (opt.)	OD 22 mm				
M34	IFC (F)	Water inlet to Freecooling					1.1/4" GAS-F
M42- 50- 58	IFC (F)						1.1/2" GAS-F
M34	OFC (F)	Water outlet from Freecooling					1.1/4" GAS-F
M42- 50- 58	OFC (F)						1.1/2" GAS-F
M34	IFC (D+H)	Water inlet to Dualfluid			1.1/4" GAS-F	1.1/4" GAS-F	
M42- 50- 58	IFC (D+H)				1.1/2" GAS-F	1.1/2" GAS-F	
M34	OFC (D+H)	Water outlet from Dualfluid			1.1/4" GAS-F	1.1/4" GAS-F	
M42- 50- 58	OFC (D+H)				1.1/2" GAS-F	1.1/2" GAS-F	
Mxx	CD	Condensate drain	ID 20 mm				
Mxx	HF	Humidifier feed (opt.)	1/2" GAS-M				
Mxx	HD	Humidifier drain (opt.)	ID 22 mm				
Mxx	EC	Electrical power supply	Hole Ø 48 mm				

* ***Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

Fig. 7. Refrigerant, water and electrical connections Liebert HPM L83-99



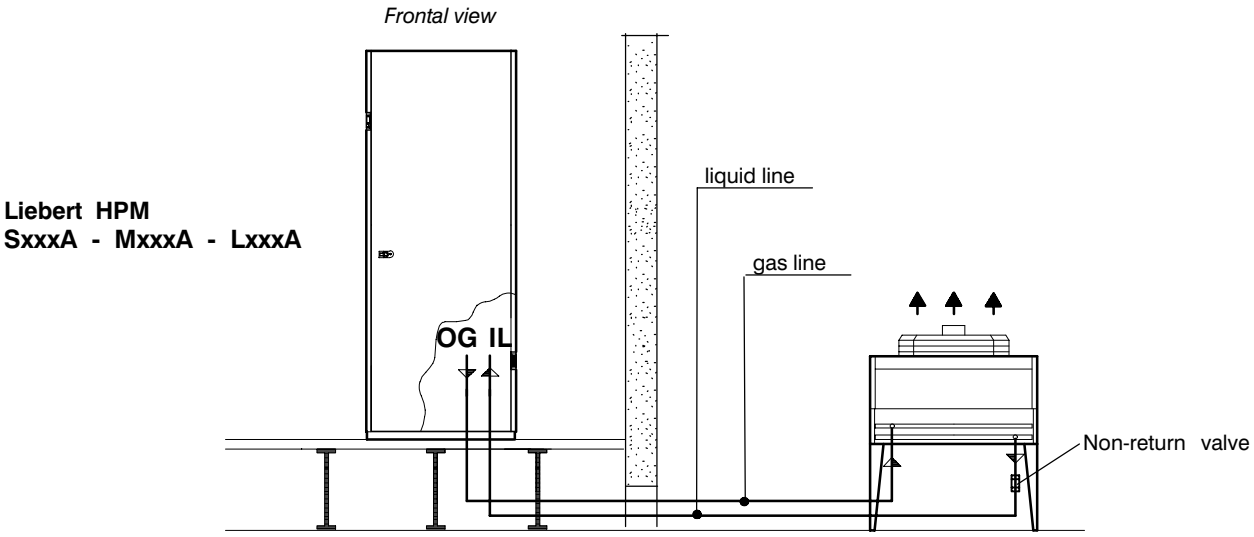
UNIT FRONT

(*) This must be cut in order to allow access for the pipes and cables

Models	Unit Connection		Version				
			A	W	D	H	F
L83- 99	IL1	Refrigerant liquid line inlet 1 *	OD 18 mm		OD 18 mm		
L83- 99	IL2	Refrigerant liquid line inlet 2 *	OD 18 mm		OD 18 mm		
L83- 99	OG1	Refrigerant gas line outlet 1 *	OD 22 mm		OD 22 mm		
L83- 99	OG2	Refrigerant gas line outlet 2 *	OD 22 mm		OD 22 mm		
L83- 99	IWC1	Water to condenser 1 inlet		1.1/4"GAS-F		1.1/4"GAS-F	
L83- 99	IWC2	Water to condenser 2 inlet		1.1/4"GAS-F		1.1/4"GAS-F	
L83- 99	OWC1	Water from condenser 1 outlet		1.1/4"GAS-F		1.1/4"GAS-F	
L83- 99	OWC2	Water from condenser 2 outlet		1.1/4"GAS-F		1.1/4"GAS-F	
Lxx	IHW	Hot water inlet (opt.)	OD 22 mm				
Lxx	OHW	Hot water outlet (opt.)	OD 22 mm				
L83	IFC (F)	Water inlet to Freecooling					2.1/2"GAS-M
L83	OFC (F)	Water outlet from Freecooling					2.1/2"GAS-M
L83	IFC (D+H)	Water inlet to Dualfluid			2.1/2"GAS-M	2.1/2"GAS-M	
L83	OFC (D+H)	Water outlet from Dualfluid			2.1/2"GAS-M	2.1/2"GAS-M	
Lxx	CD	Condensate drain	ID 20 mm				
Lxx	HF	Humidifier feed (opt.)	1/2" GAS-M				
Lxx	HD	Humidifier drain (opt.)	ID 22 mm				
Lxx	EC	Electrical power supply	Hole ∅ 80 mm				

**** Connection size only. The dimension of the connecting pipe depends on unit model and refrigerant, see Tab. c on para. 4.1.2.***

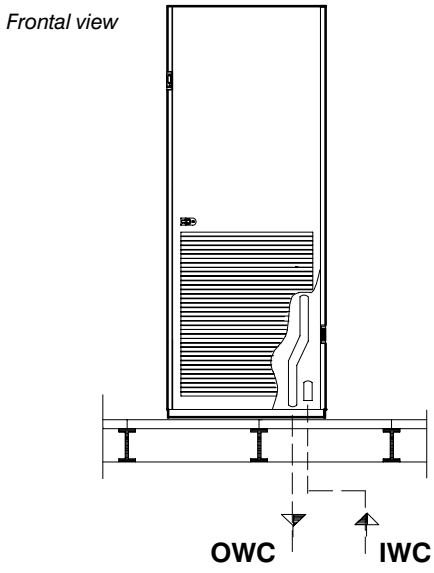
Fig. 8. Refrigeration connections



IL	Refrigerant pipe inlet
OG	Refrigerant pipe outlet

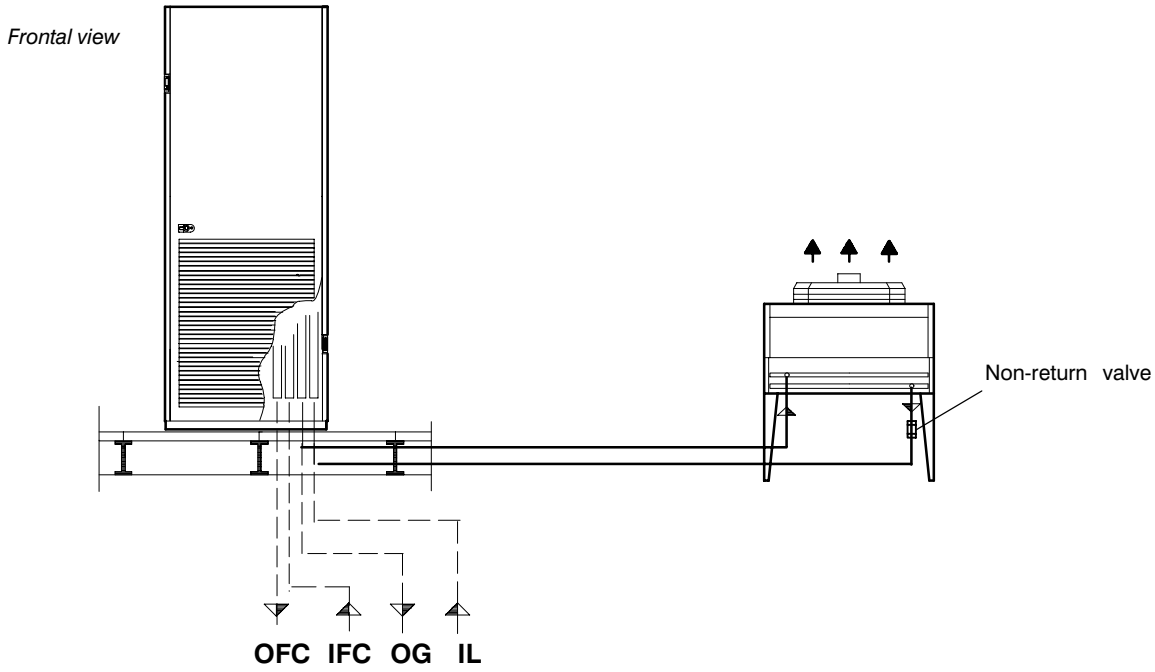
Notes: *recommended diameters see Table in Chap. 4.*

Fig. 9. Water connections Liebert HPM SxxxF/H, MxxxF/H and LxxxF/H



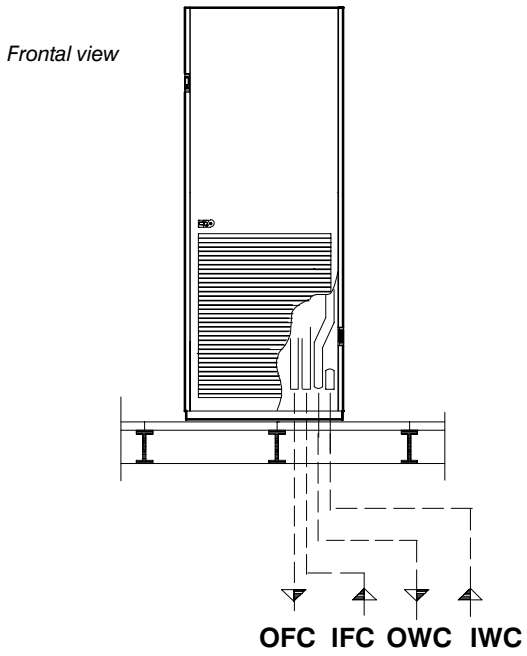
IWC	Water to condenser inlet
OWC	Water from condenser outlet

Fig. 10. Chilled water and refrigerant connections Liebert HPM SxxxD, MxxxD and LxxxD



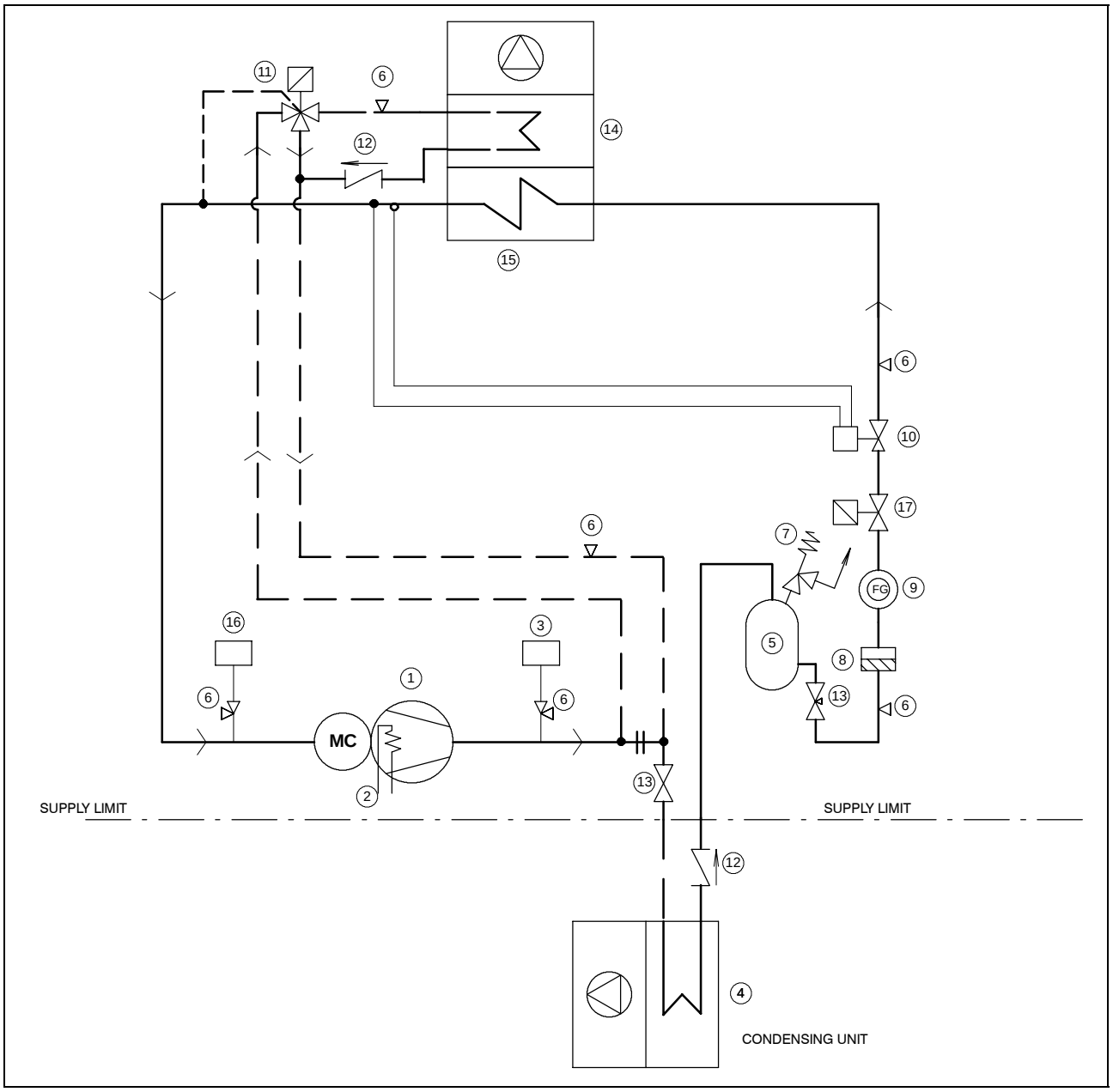
IL	Refrigerant liquid line inlet
OG	Refrigerant gas line outlet
IFC	Water inlet to Freecooling coil
OFC	Water outlet to Dry-Cooler

Fig. 11. Chilled water and refrigerant connections Liebert HPM SxxxF/H, MxxxF/H and LxxxF/H



IWC	Water to condenser inlet
OWC	Water from condenser outlet
IFC	Water inlet to Freecooling coil
OFC	Water outlet to Dry-Cooler

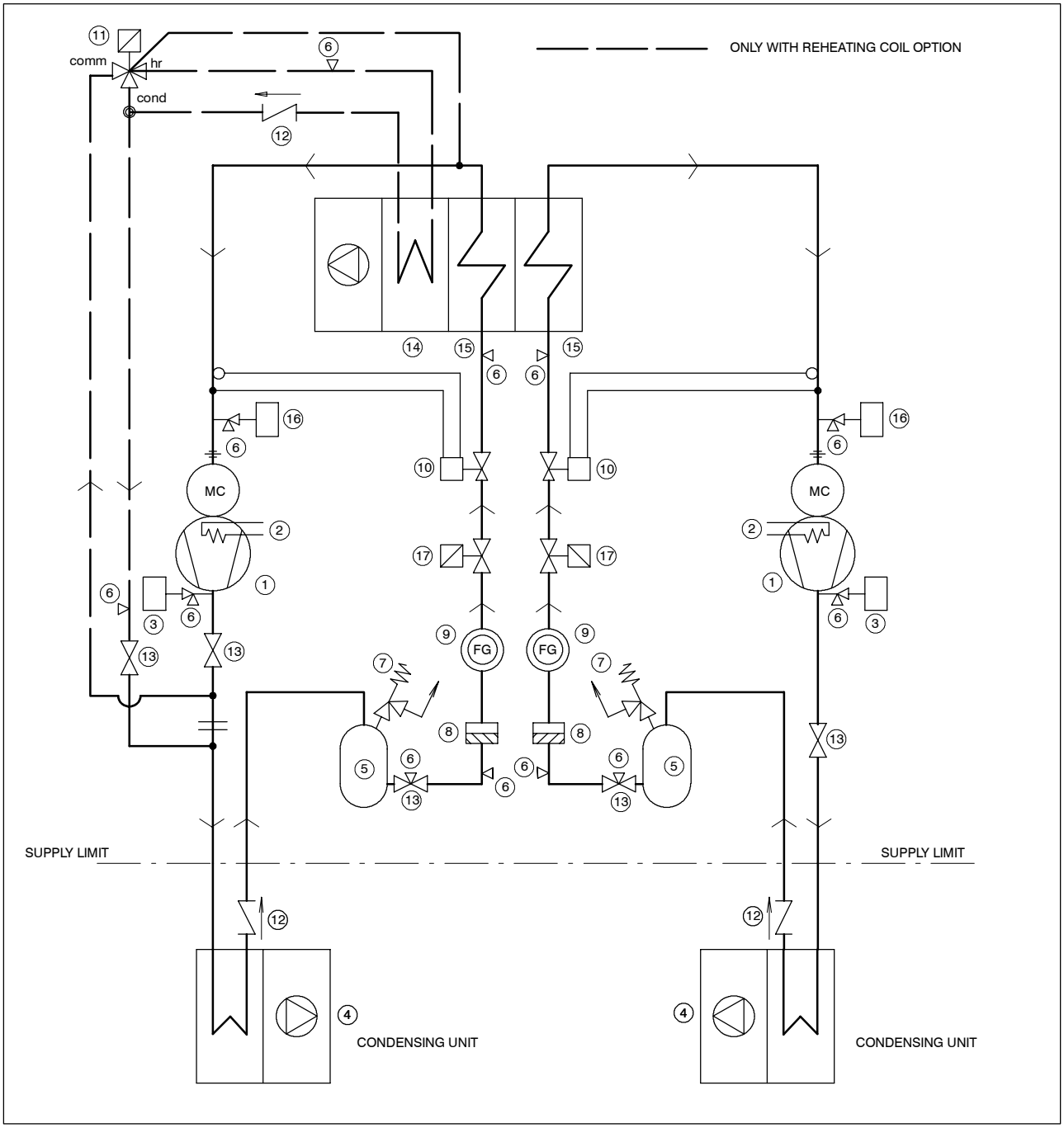
Fig. 1. Liebert HPM Sxx U/O A, M25–47 U/O A



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve

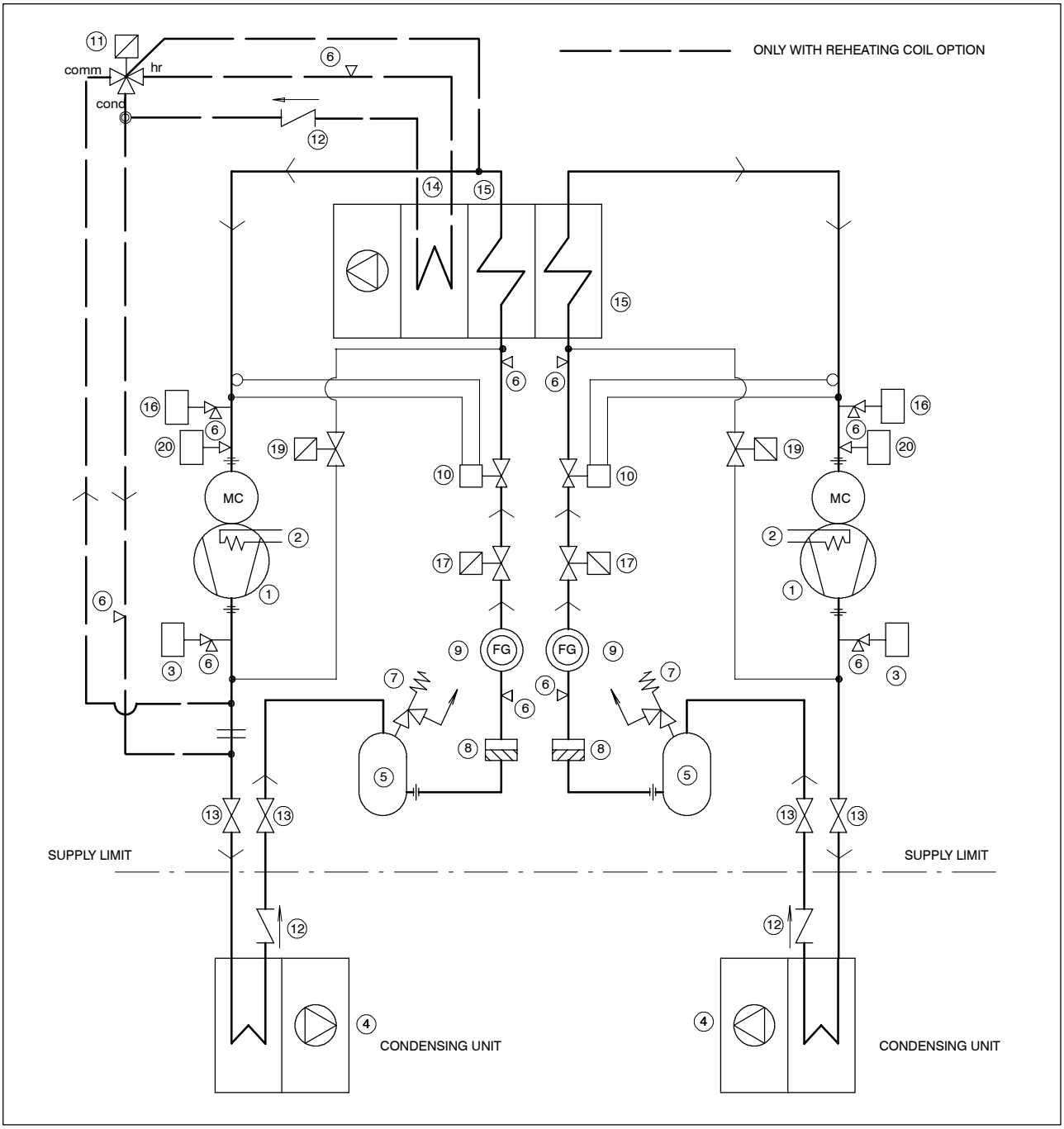
Fig. 2. Liebert HPM M34–66 U/O A



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass

POS.	DESCRIPTION
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve

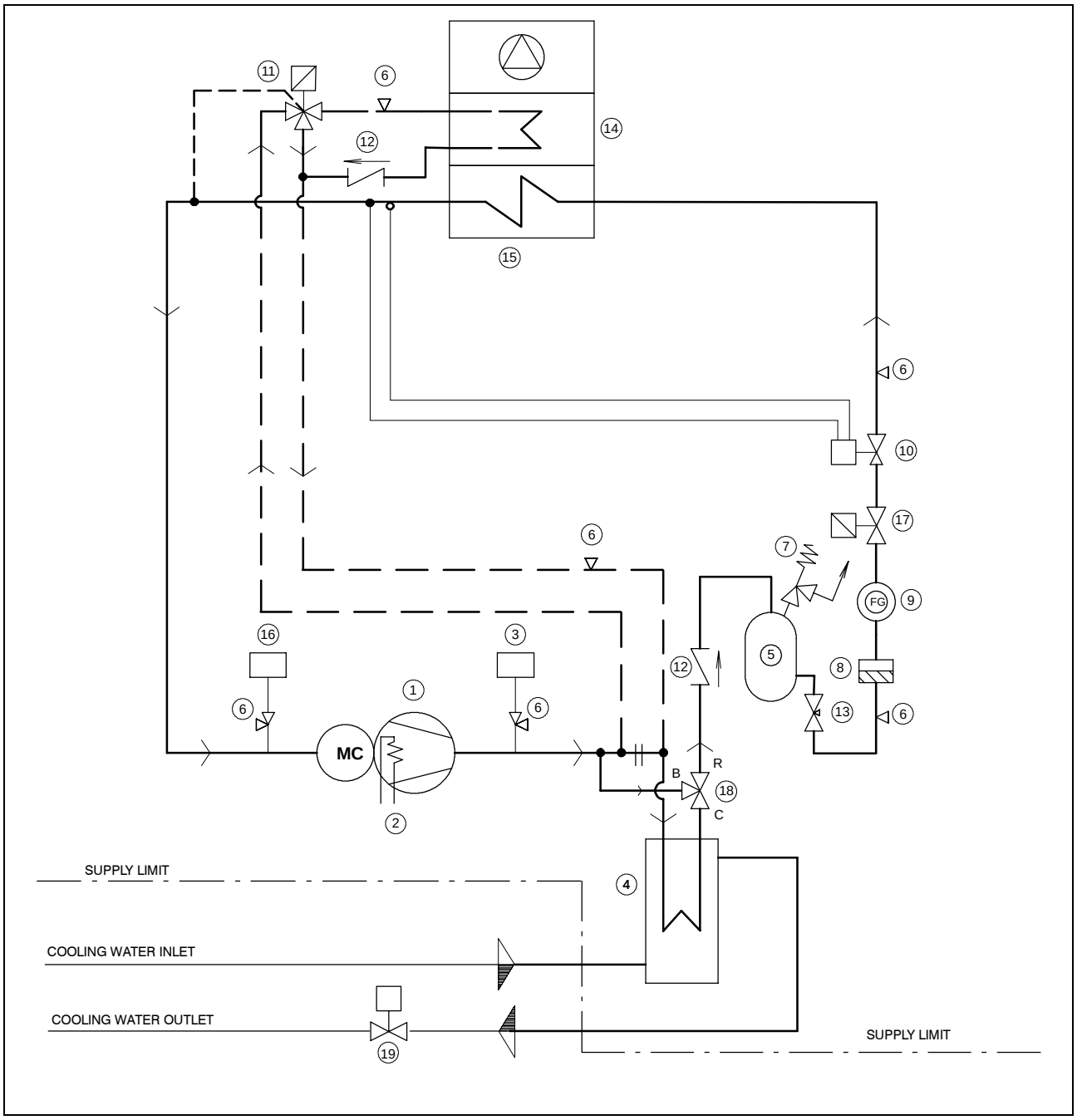
Fig. 3. Liebert HPM L83–99 U A



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
19	Hot gas valve injection
20	On/off pressure switch for hot gas valve injection

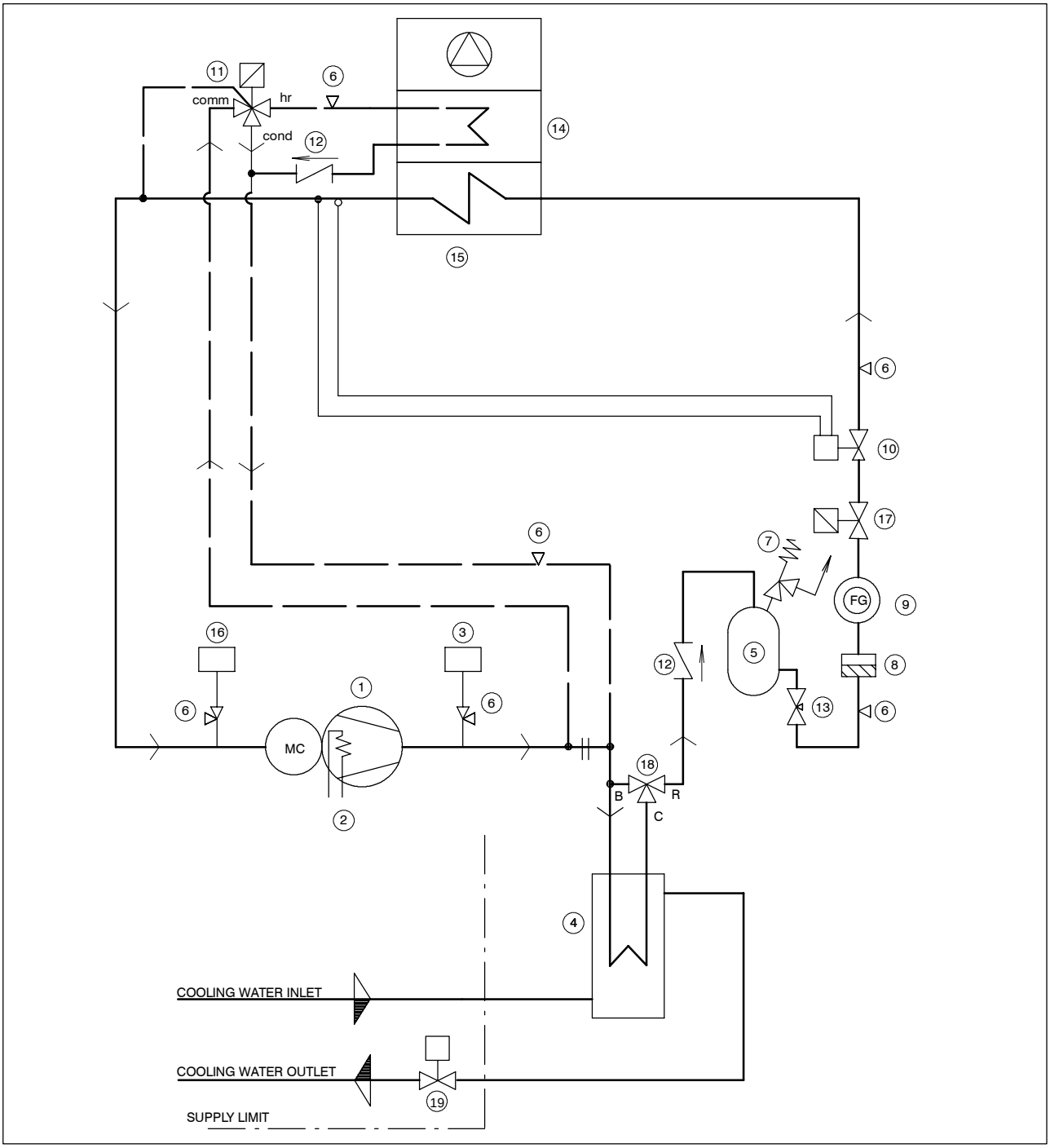
Fig. 4. Liebert HPM Sxx U/O W



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Water solenoid valve (by the customer)

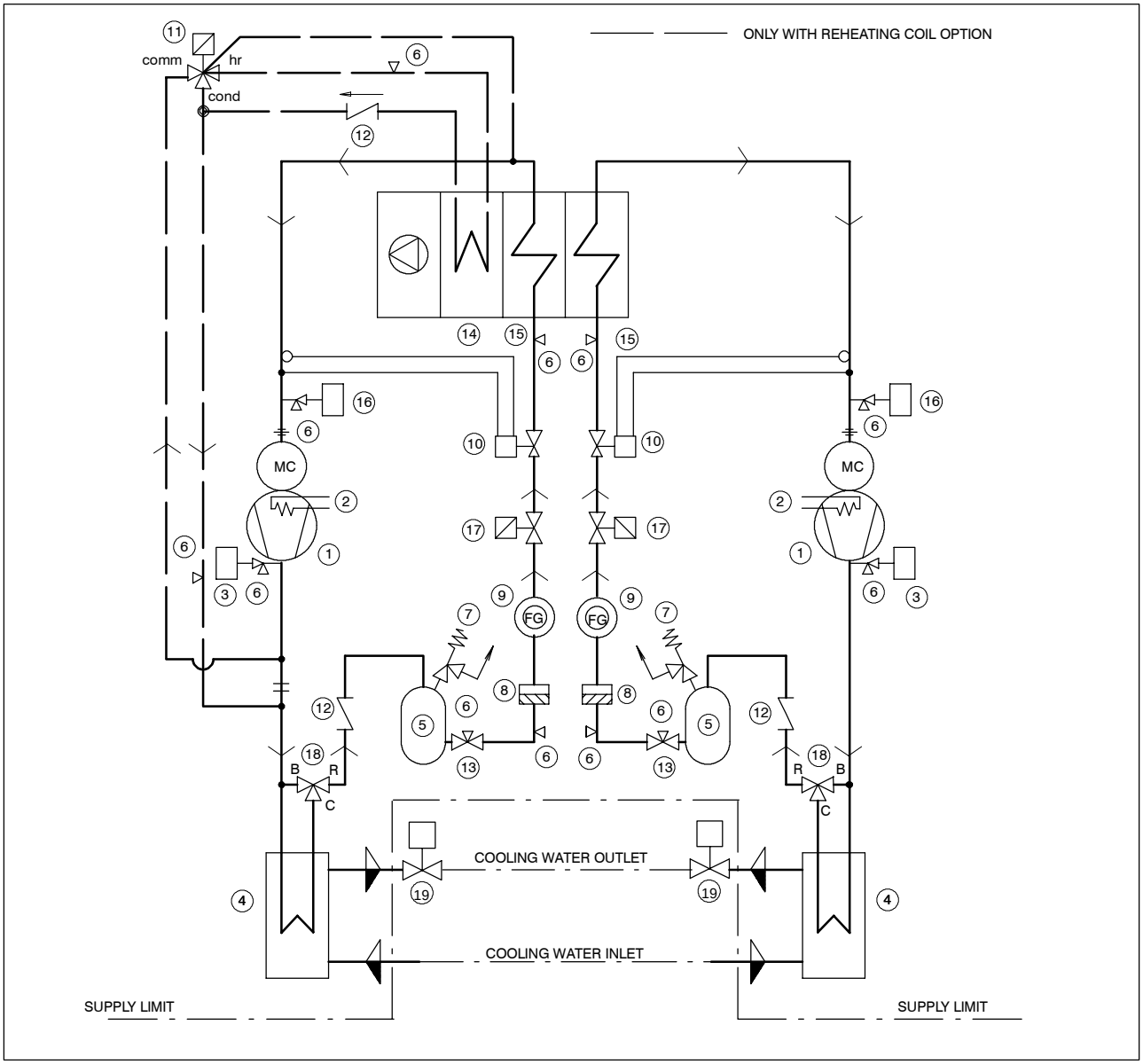
Fig. 5. Liebert HPM M25–47 U/O W



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Water solenoid valve (by the customer)

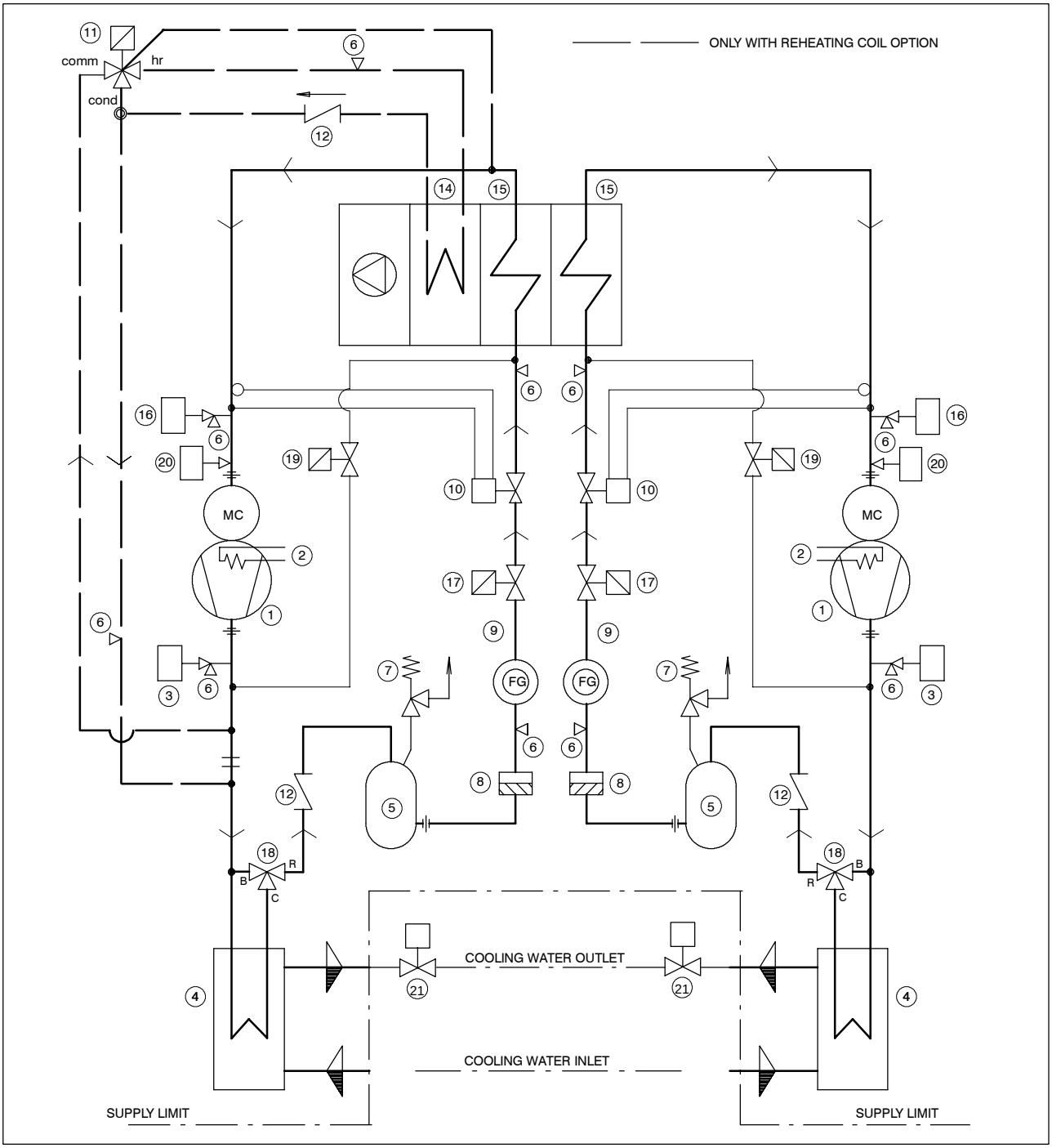
Fig. 6. Liebert HPM M34–66 U/O W



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Water solenoid valve (by the customer)

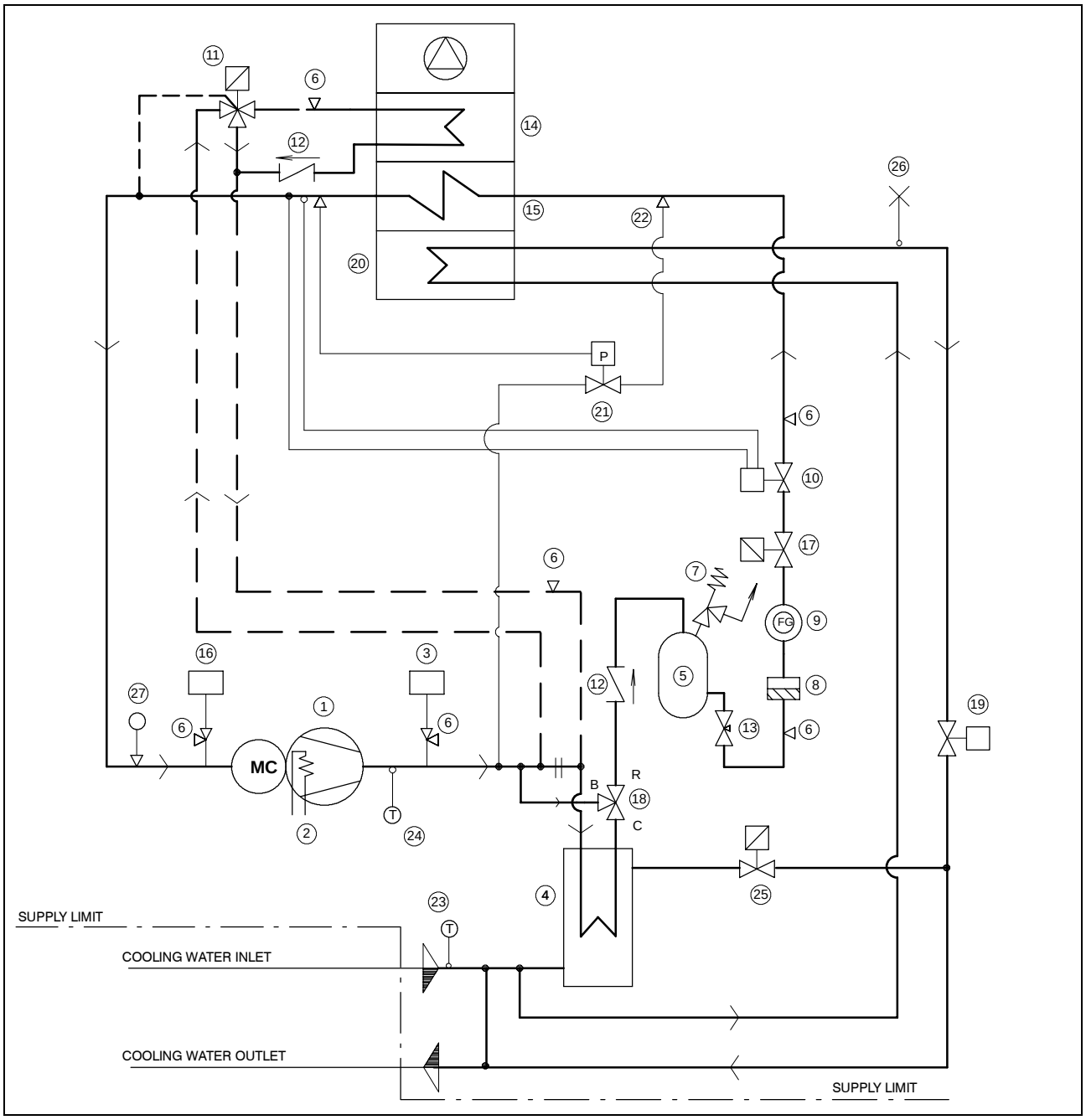
Fig. 7. Liebert HPM L83–99 U W



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)

POS.	DESCRIPTION
12	Check valve
13	Shut–off valve
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Hot gas valve injection
20	On/off pressure switch for hot gas valve injection
21	Water solenoid valve (by the customer)

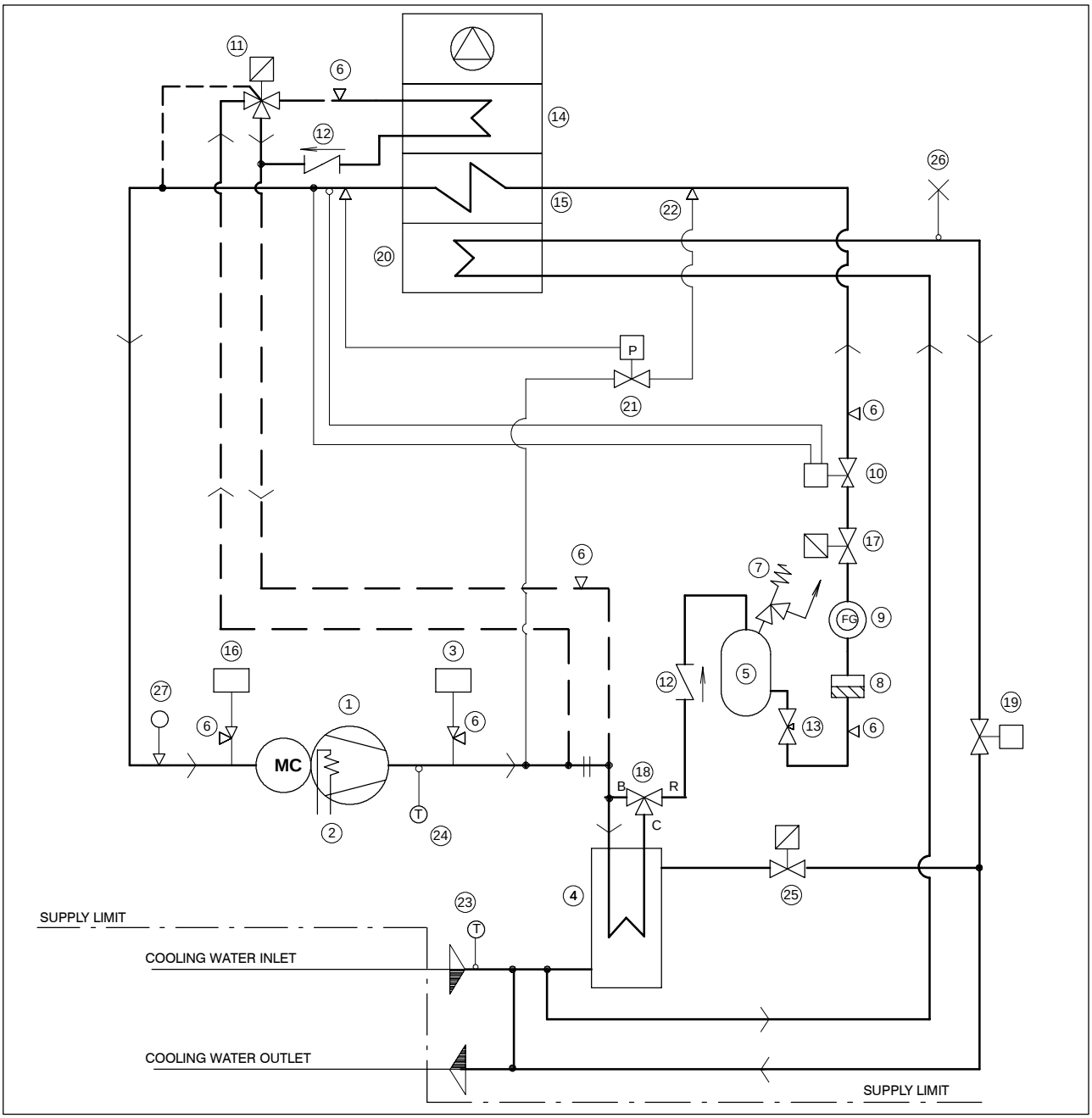
Fig. 8. Liebert HPM Sxx U/O F



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 2–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Solenoid water valve
26	Manual bleed valve
27	Low pressure transducer

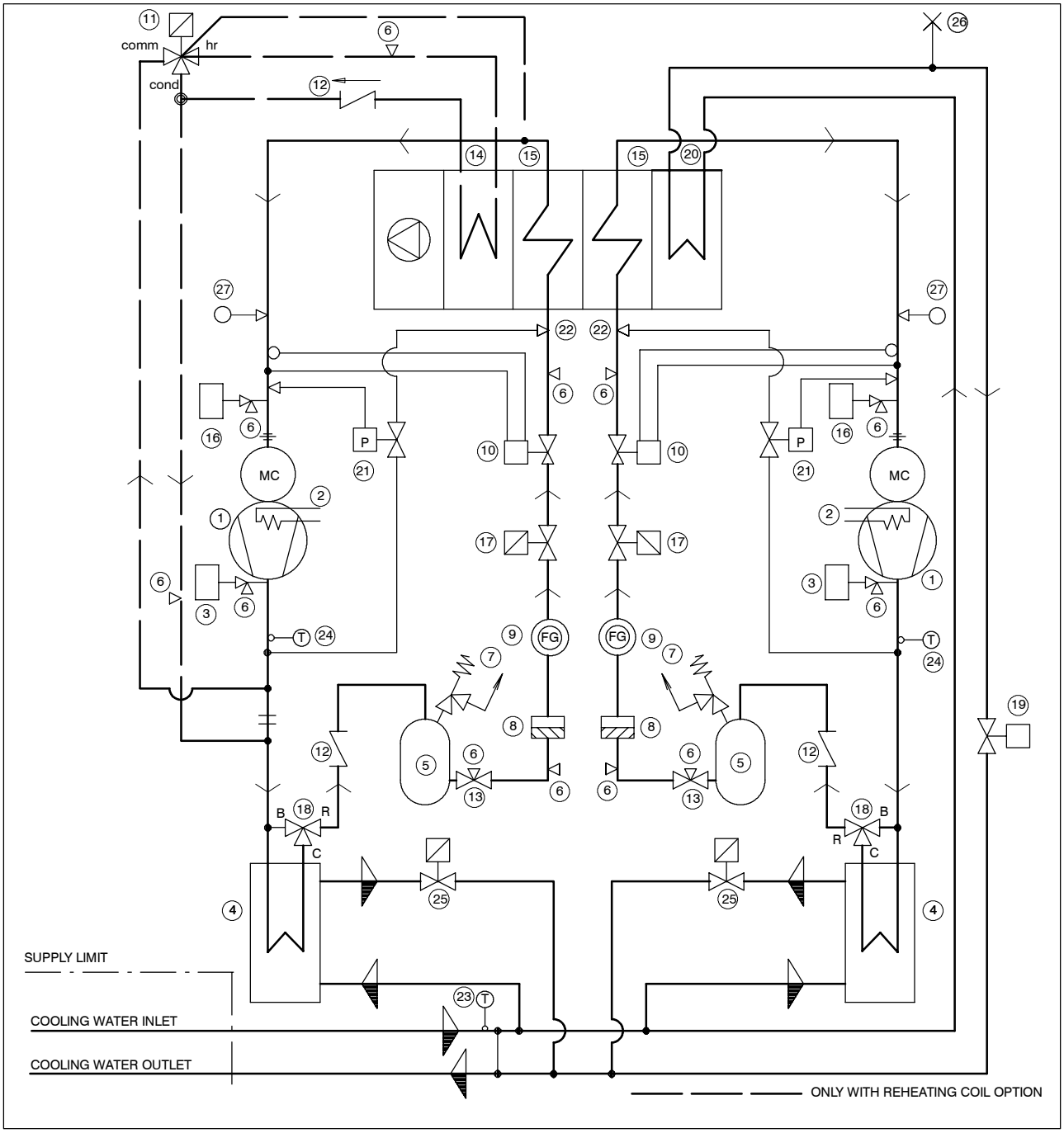
Fig. 9. Liebert HPM M25–47 U/O F



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 2–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Solenoid water valve
26	Manual bleed valve
27	Low pressure transducer

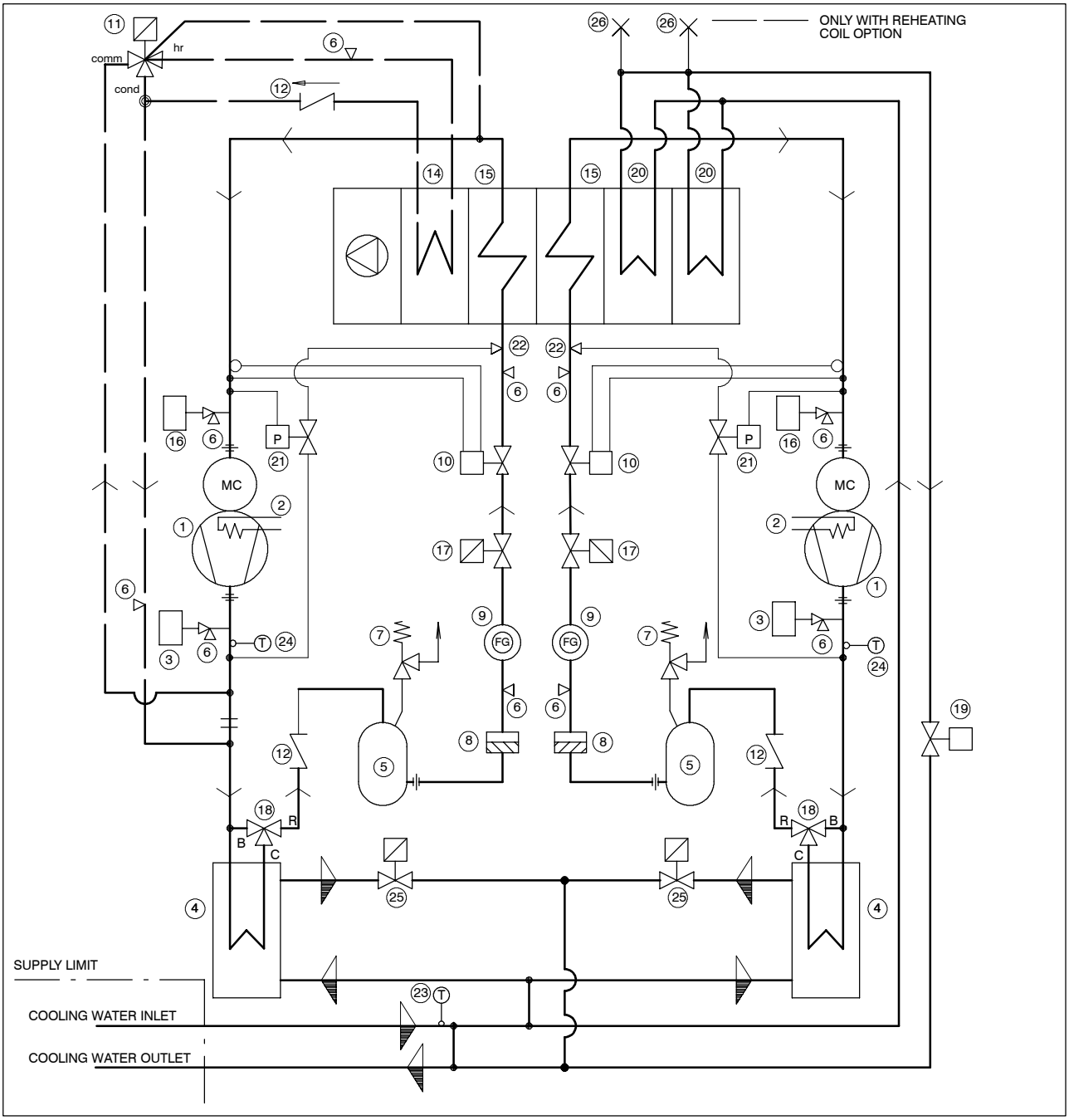
Fig. 10. Liebert HPM M34–58 U/O F



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 2–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Solenoid water valve
26	Manual bleed valve
27	Low pressure transducer

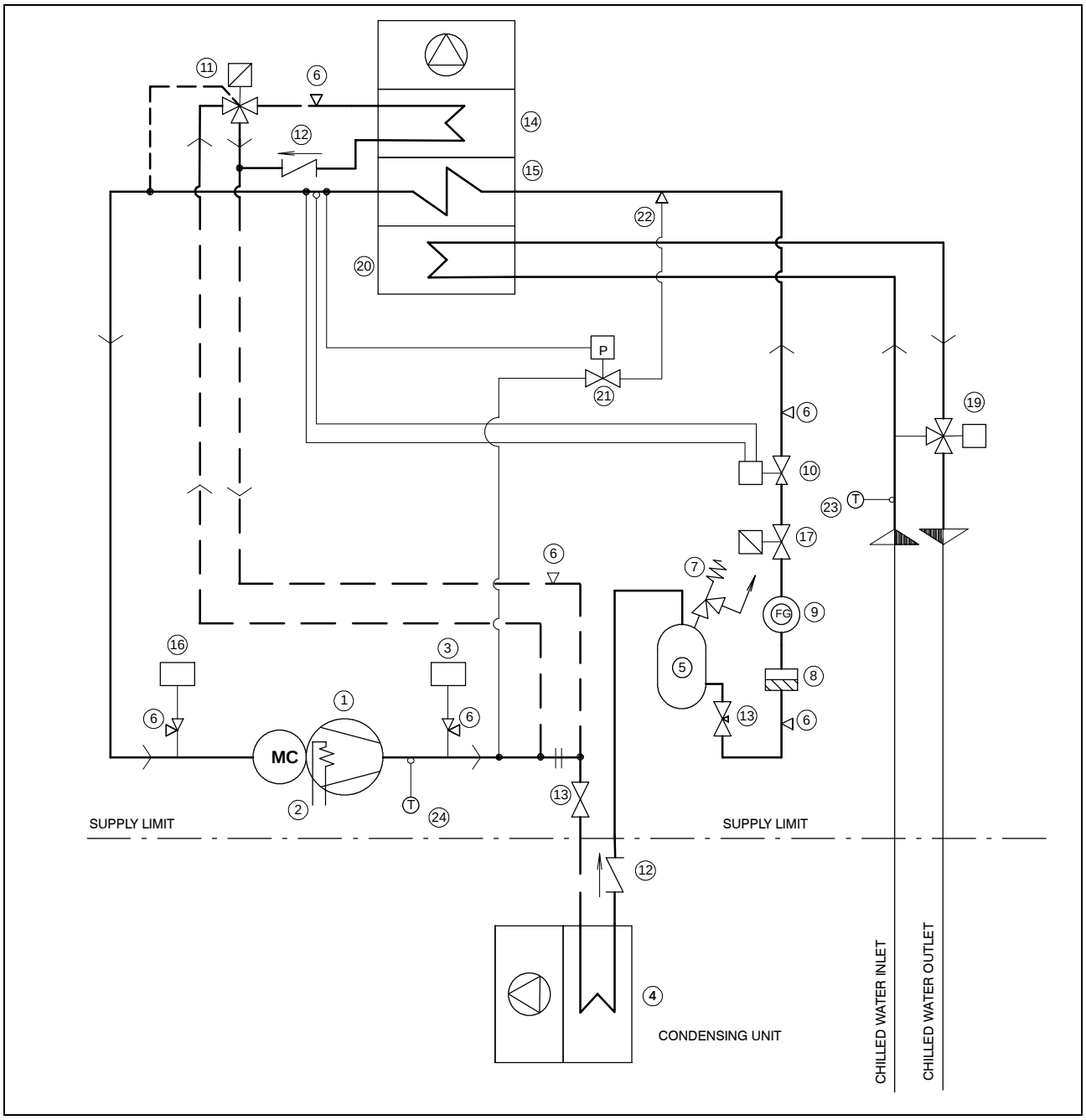
Fig. 11. Liebert HPM L83 U F



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 2–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Shut–off solenoid water valve
26	Manual bleed valve

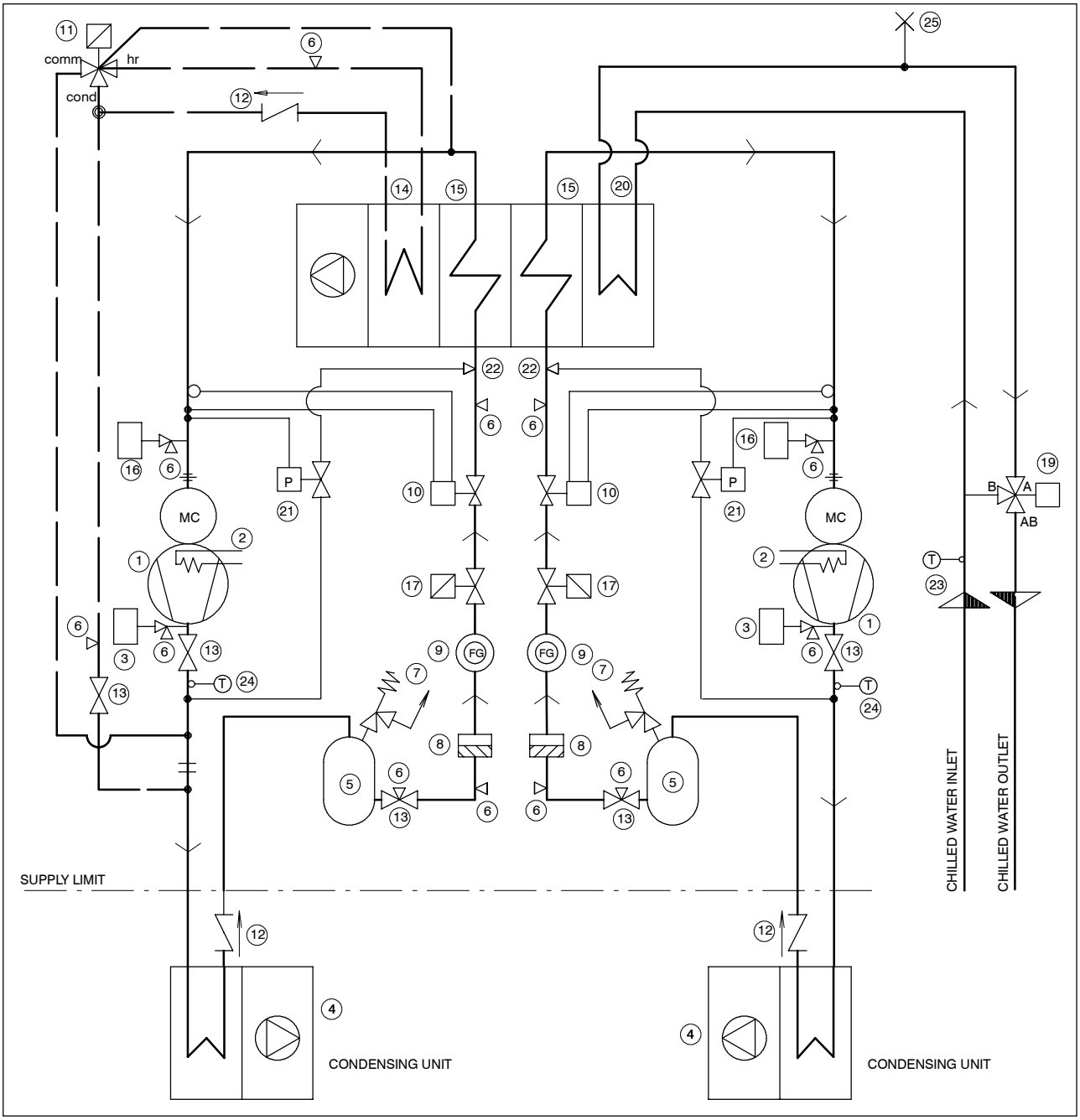
Fig. 12. Liebert HPM Sxx U/O D, M25–47 U/O D



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	–
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Solenoid water valve

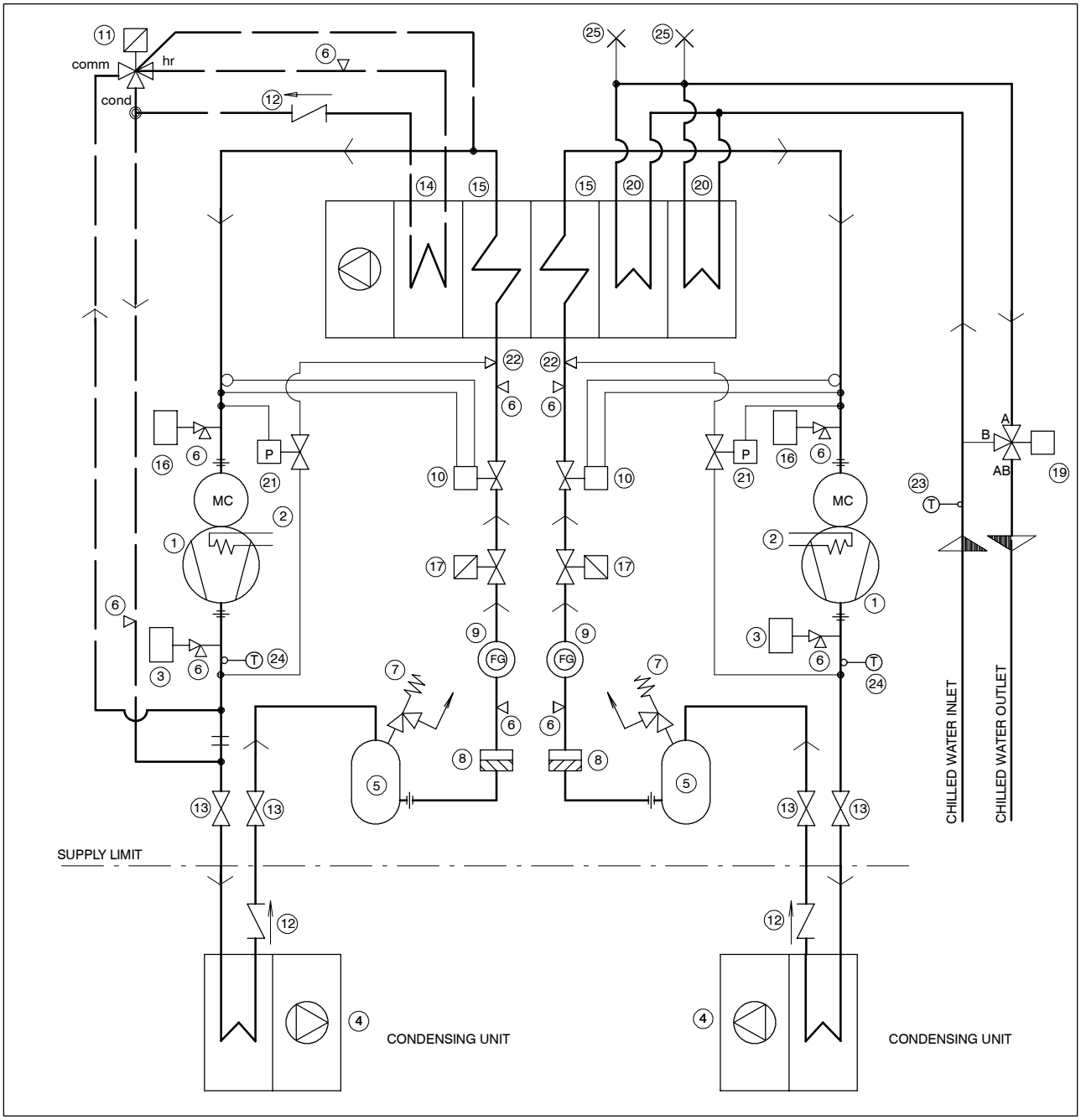
Fig. 13. Liebert HPM M34–58 U/O D



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Manual bleed valve

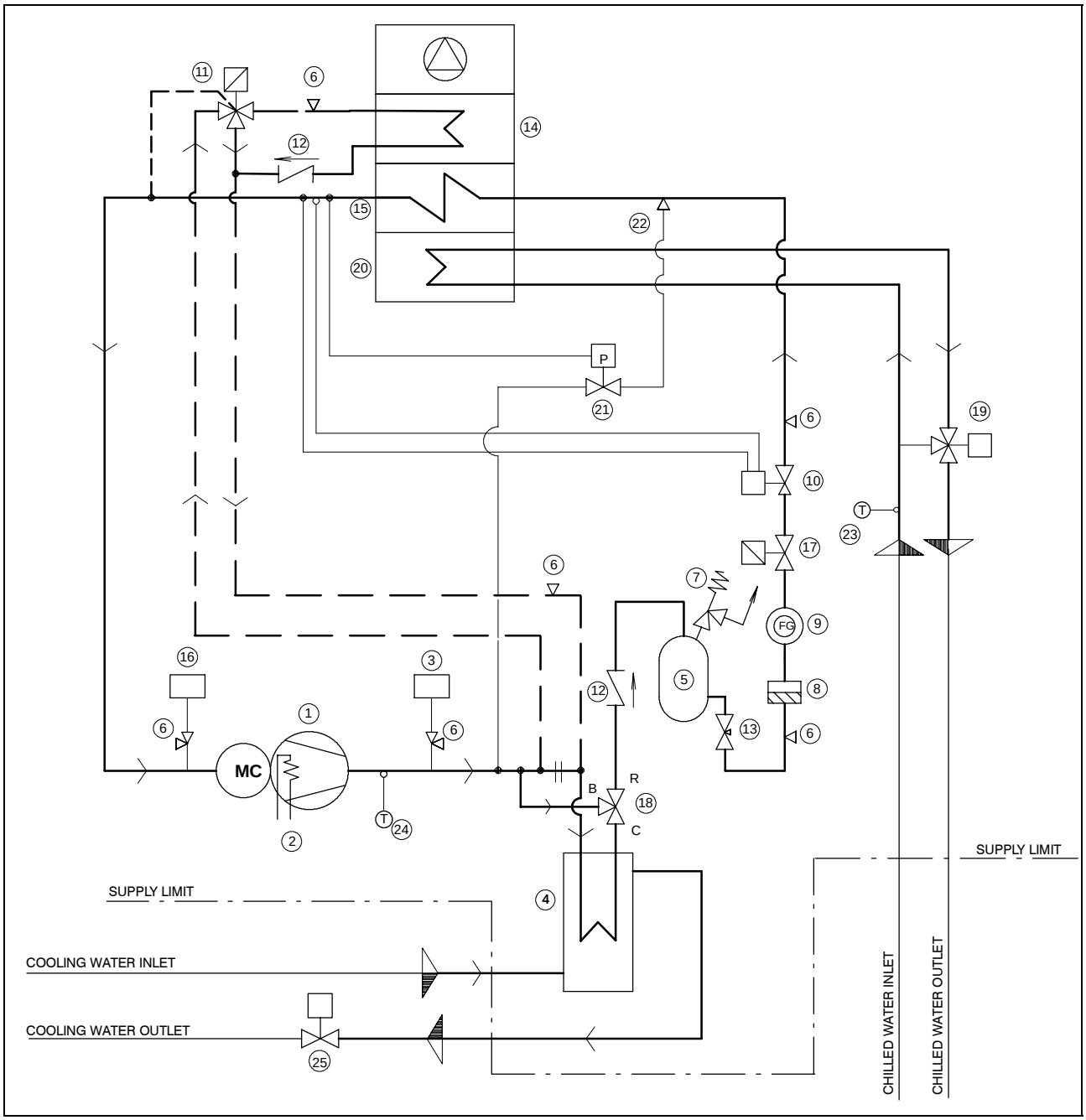
Fig. 14. Liebert HPM L83 U D



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	–
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Manual bleed valve

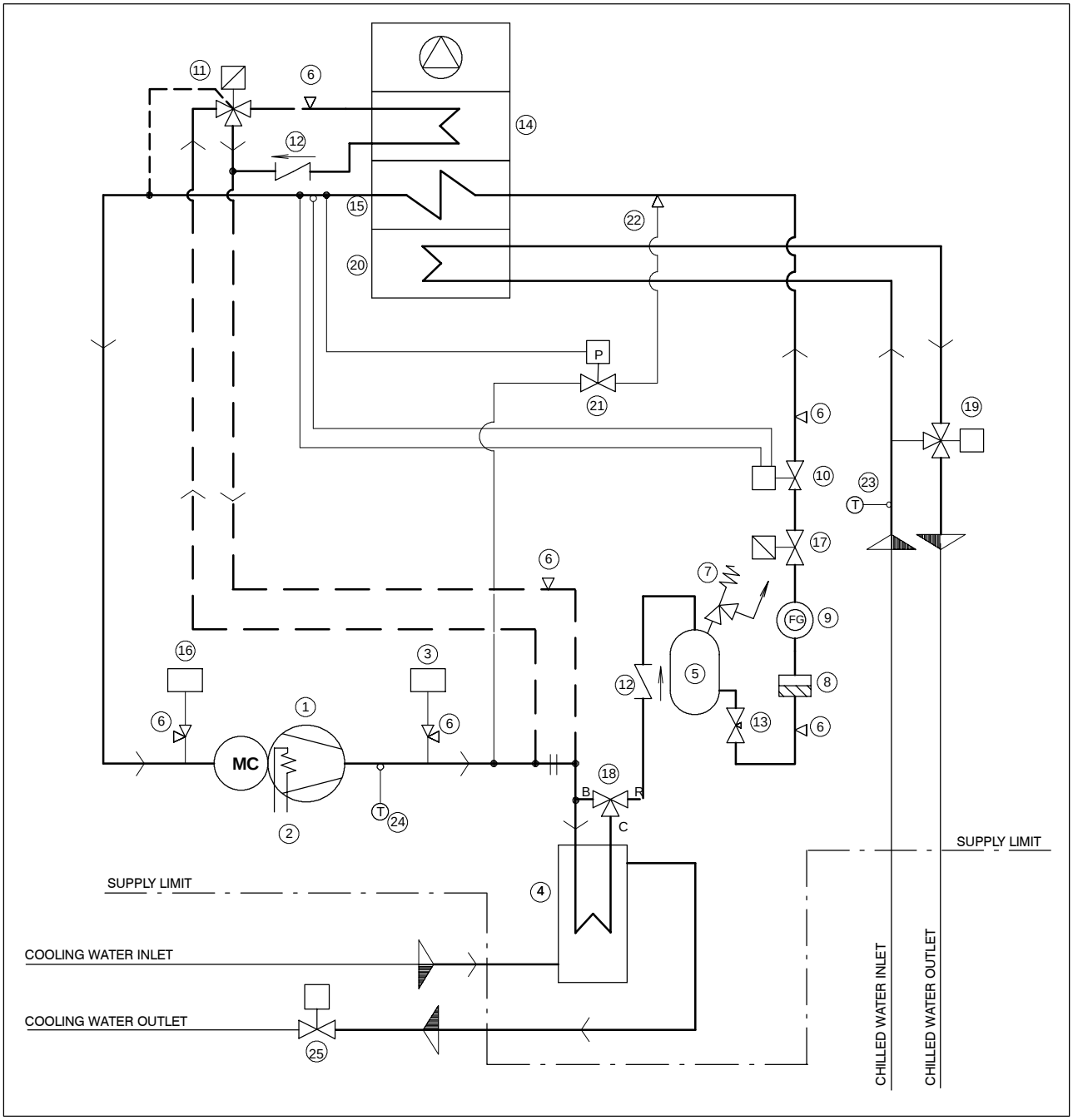
Fig. 15. Liebert HPM Sxx U/O H



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Water solenoid valve (by the customer)

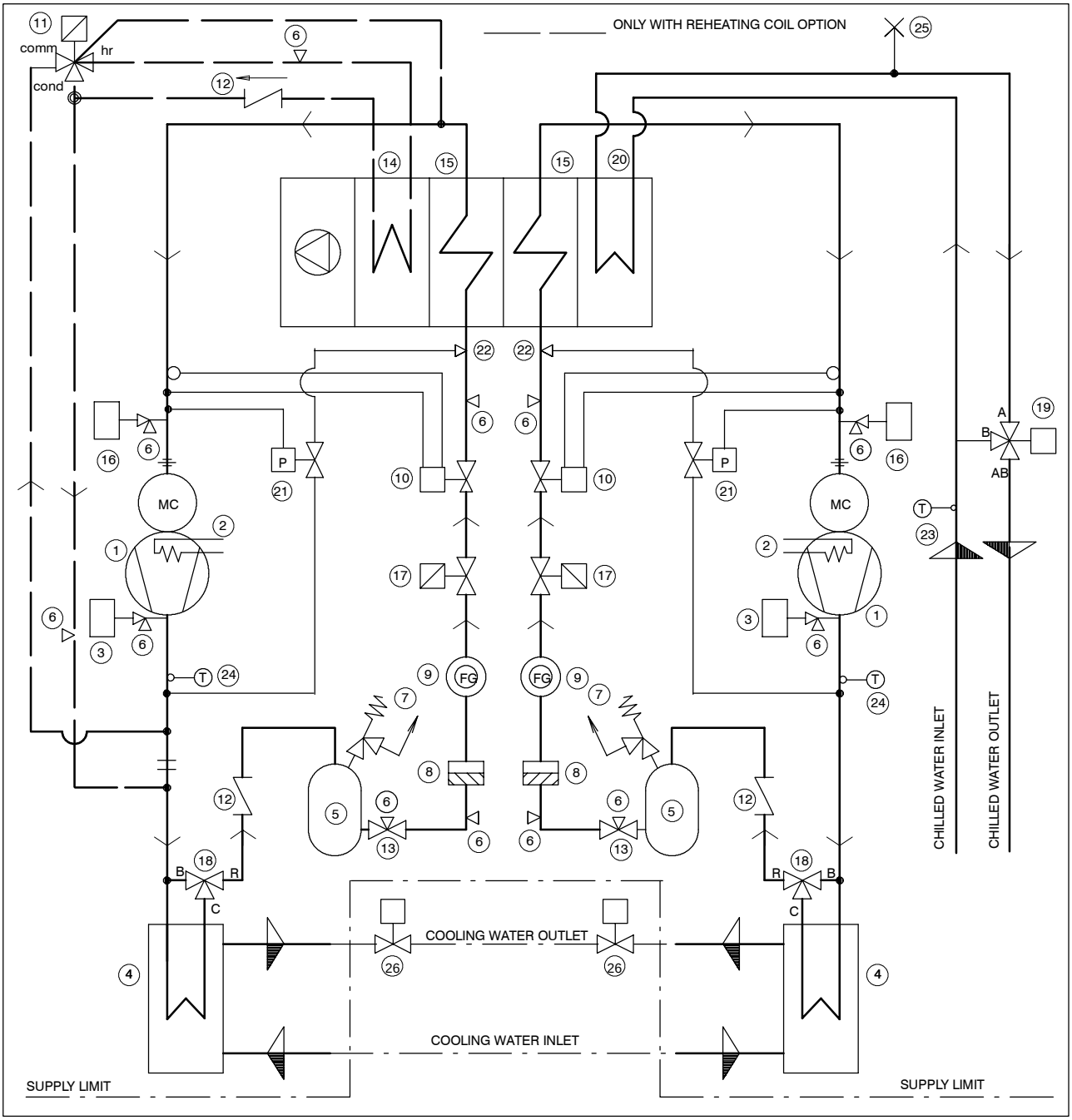
Fig. 16. Liebert HPM M25–47 U/O H



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Water solenoid valve (by the customer)

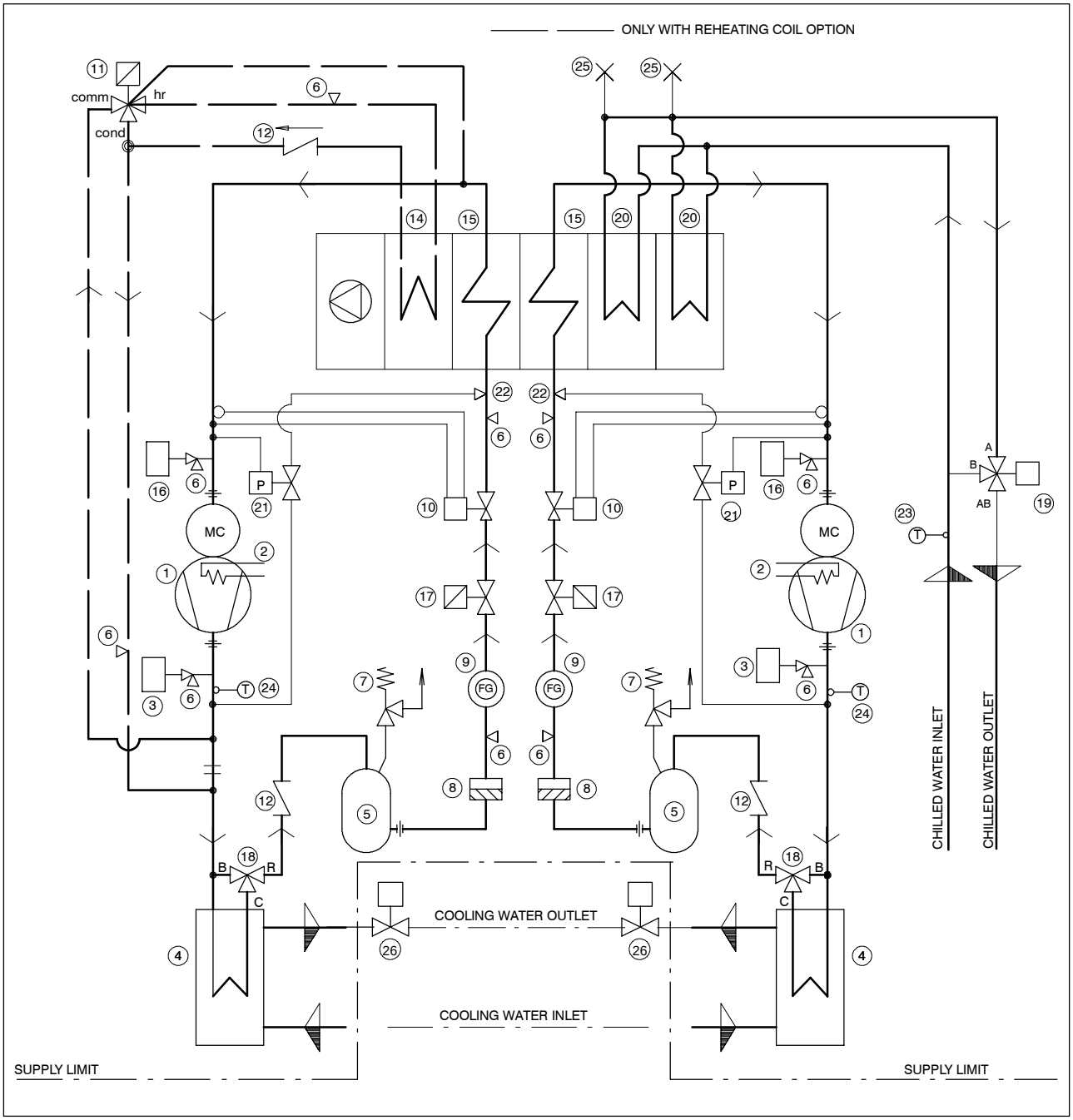
Fig. 17. Liebert HPM M34–58 U/O H



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Manual bleed valve
26	Water solenoid valve (by the customer)

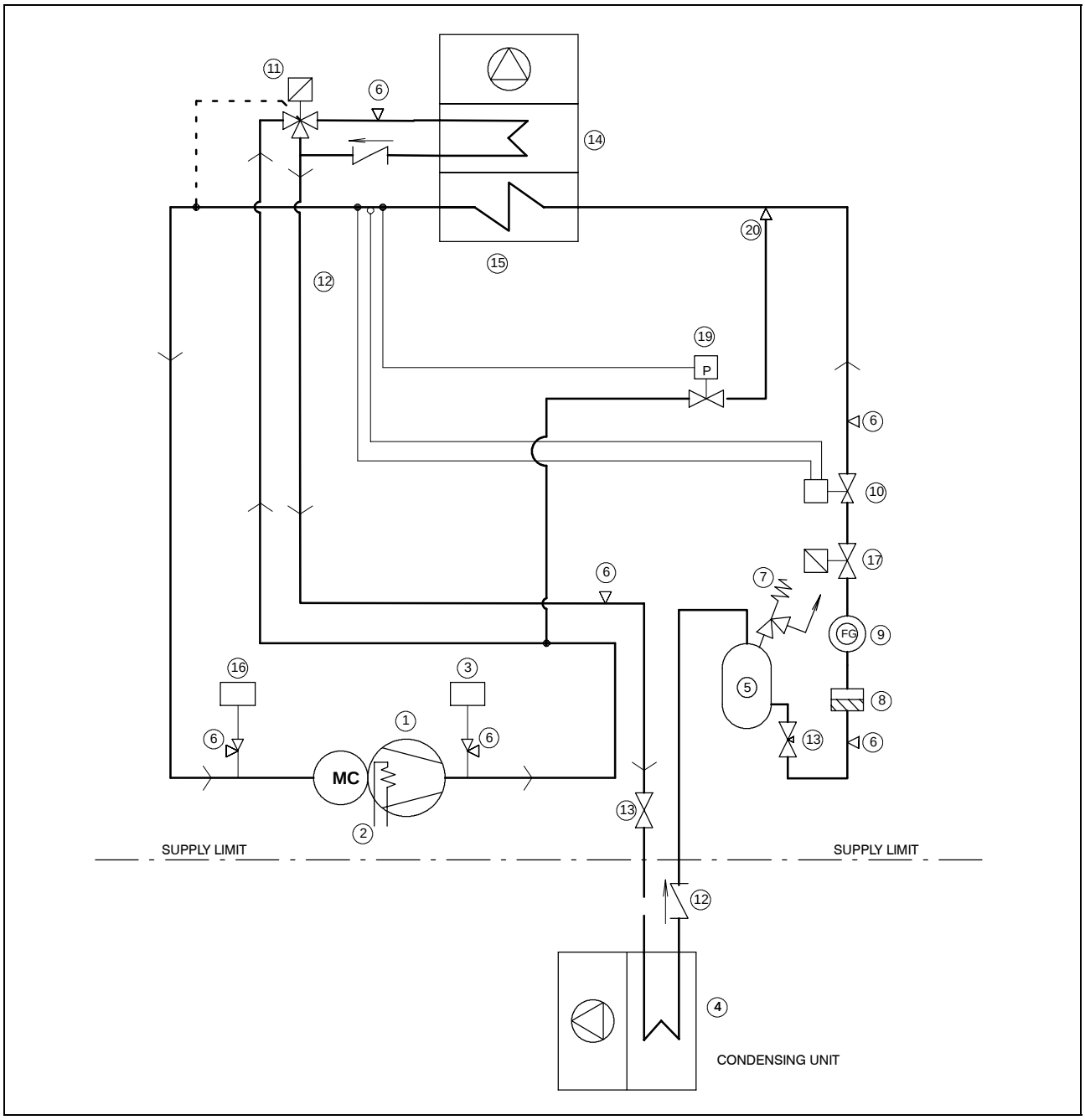
Fig. 18. Liebert HPM L83 U H



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve
11	Hot gas ON–OFF solenoid valve (optional)
12	Check valve
13	Shut–off valve

POS.	DESCRIPTION
14	Reheating coil (optional)
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Chilled water 3–way valve
20	Chilled water coil
21	Hot gas injection valve (antifreeze)
22	Hot gas injector
23	Inlet water thermostat
24	Safety thermostat
25	Manual bleed valve
26	Water solenoid valve (by the customer)

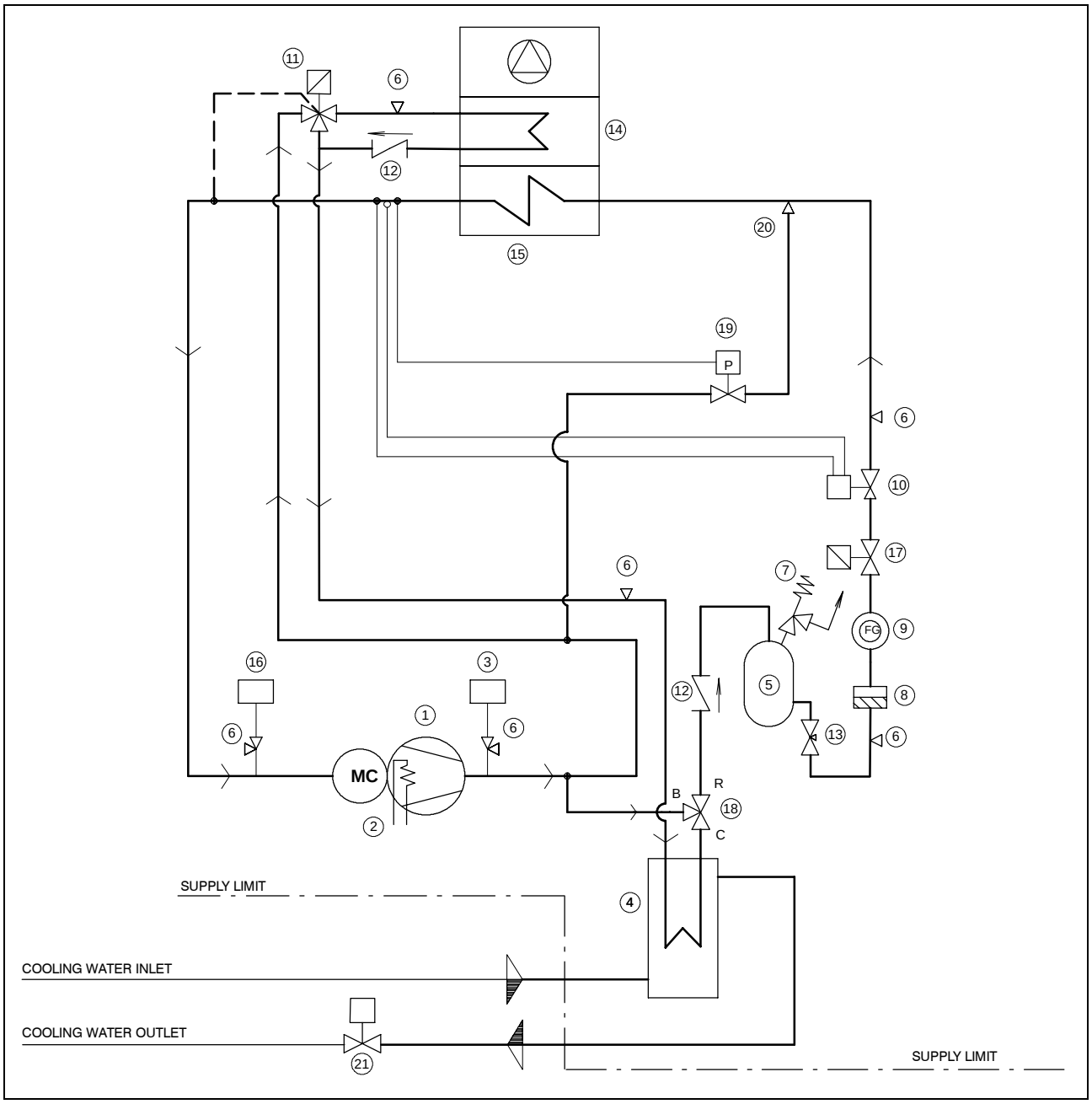
Fig. 19. Liebert HPM Sxx KA, M25 KA



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	3–way hot gas modulating valve
12	Check valve
13	Shut–off valve
14	Reheating coil
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	–
19	Hot gas injection valve (antifreeze)
20	Hot gas injector

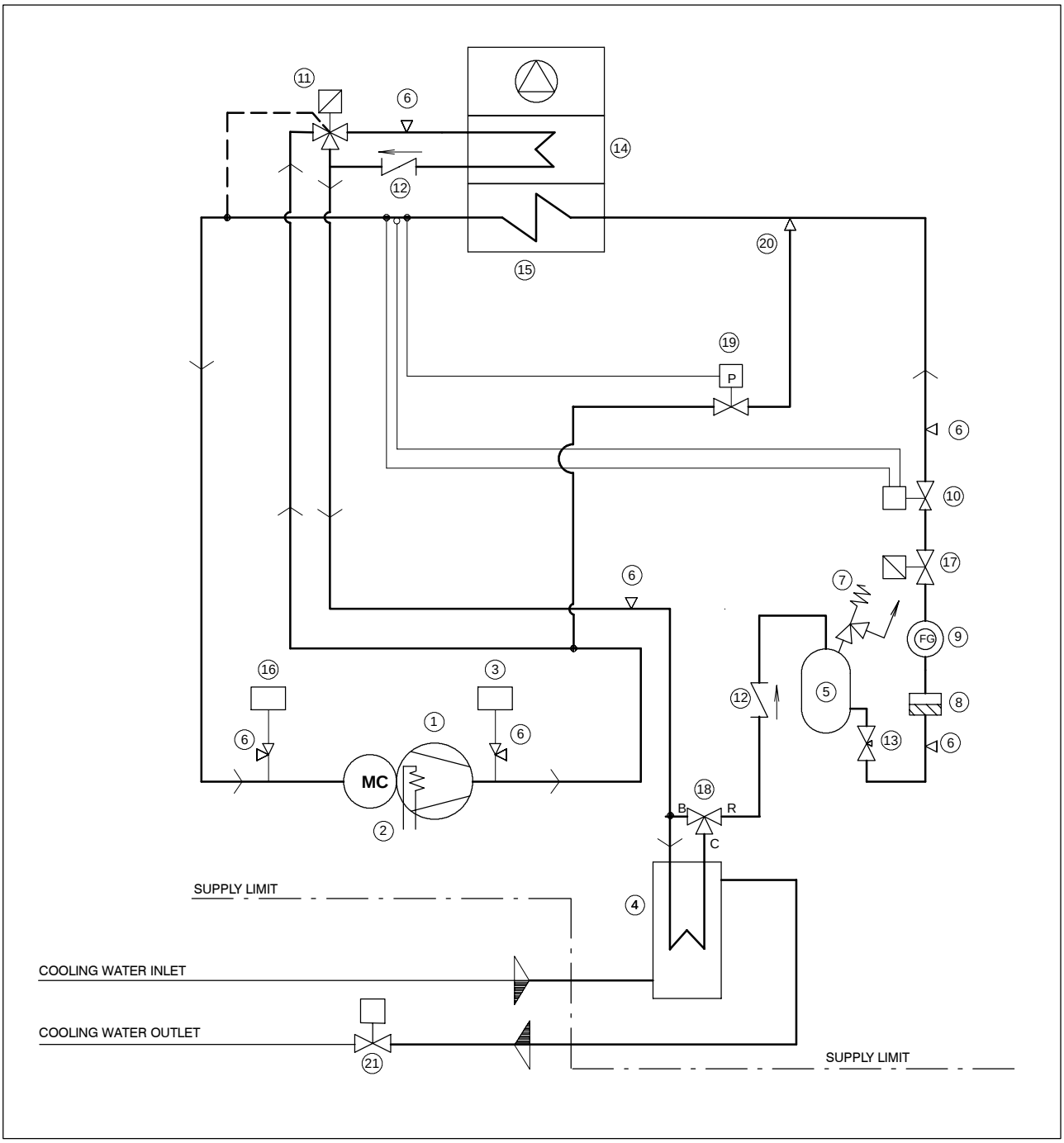
Fig. 20. Liebert HPM Sxx KW



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	3–way hot gas modulating valve
12	Check valve
13	Shut–off valve
14	Reheating coil
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Hot gas injection valve (antifreeze)
21	Water solenoid valve (by the customer)

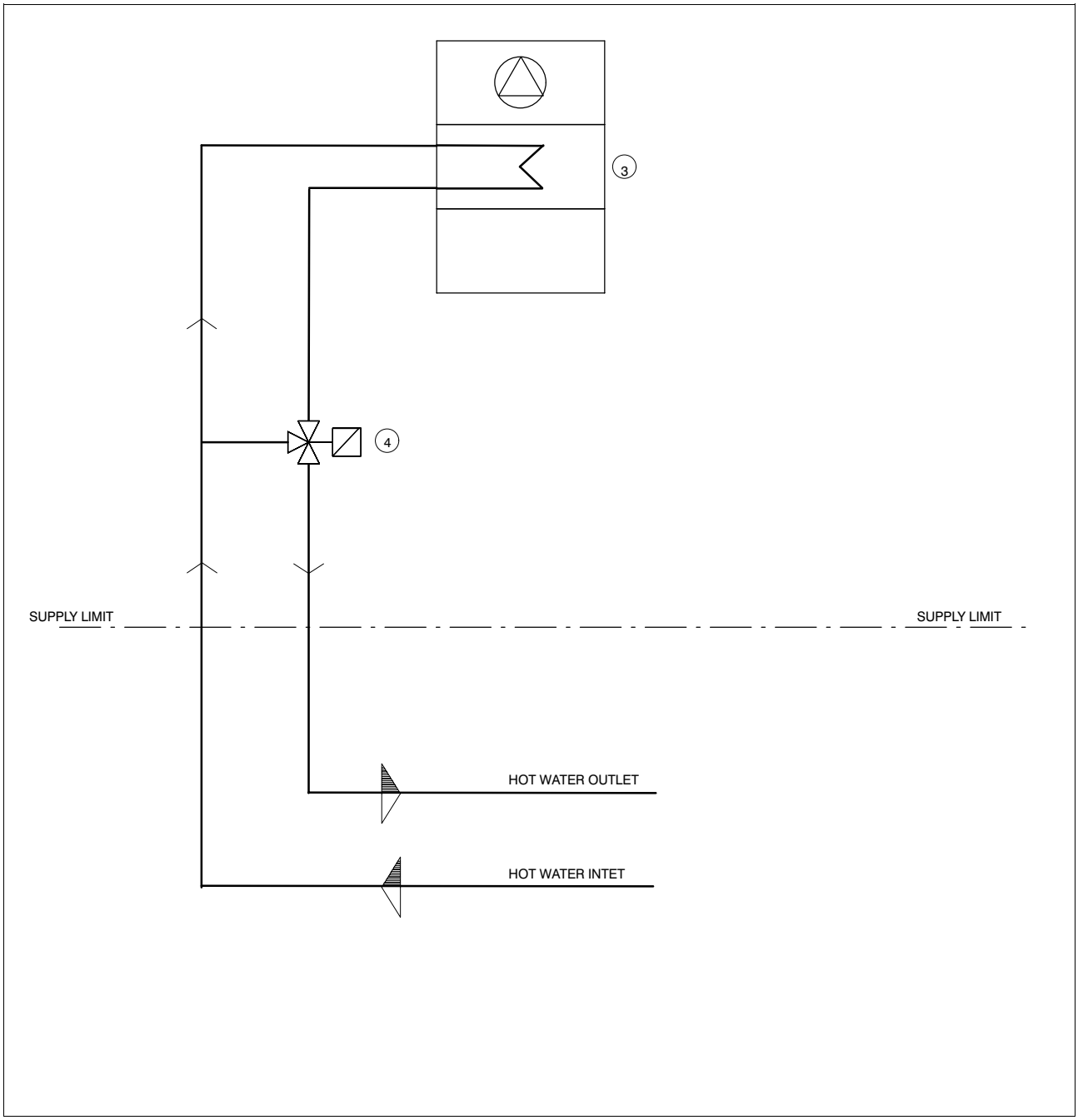
Fig. 21. Liebert HPM M25 KW



POS.	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Water cooled condenser
5	Liquid receiver
6	Access valve
7	Safety valve
8	Filter dryer
9	Sight glass
10	Thermostatic expansion valve

POS.	DESCRIPTION
11	3–way hot gas modulating valve
12	Check valve
13	Shut–off valve
14	Reheating coil
15	Evaporator
16	Low pressure switch (LP)
17	Shut–off solenoid valve
18	Head pressure control valve
19	Hot gas injection valve (antifreeze)
21	Water solenoid valve (by the customer)

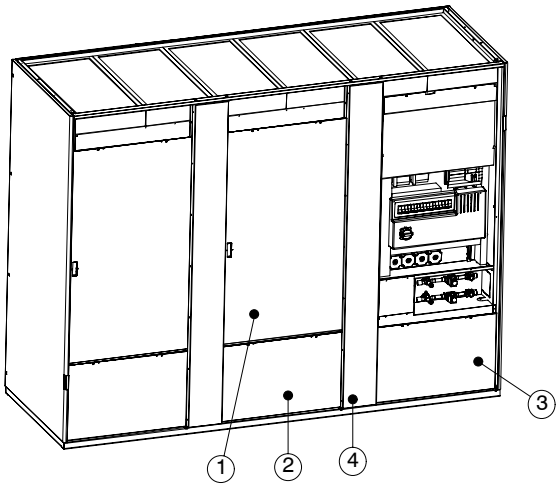
Fig. 1. Hot water reheating coil - optional



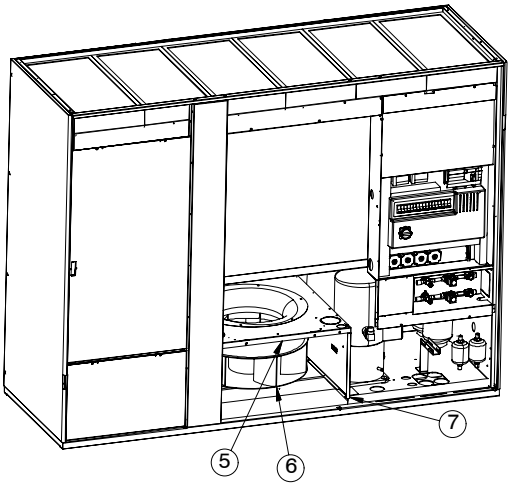
POS.	Optional components
3	Hot water coil
4	Hot water 3- way valve

Fig. 1 Compressor removal (Liebert HPM L83–99 only)

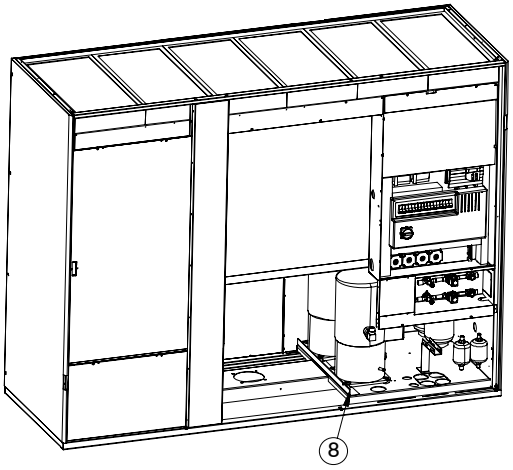
STEEP 1



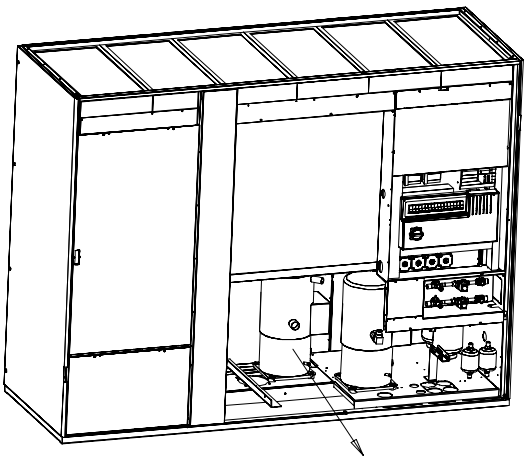
STEEP 2



STEEP 3



STEEP 4



STEEP 1: remove 1, 2, 3 and 4
STEEP 2: remove 5, 6 and 7
STEEP 3: remove 8, remove screws from compressor
STEEP 4: remove compressor

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